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**EAO CERTIFIED
ISO 9001**

World Class Switching Products

General Catalog 102



EAO adds style and value to your product



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General Purpose
Pushbuttons
and Indicators

Oil and Watertight
Switches and
Indicators

Keylock
Switches

Printed
Circuit Board
Switches

Systems,
Buzzers,
Flashers,

Accessories,
Lamps,
Legends

Technical
Information

Note: Although every effort has been made to ensure the accuracy of this catalog, errors and omissions, typographical, clerical, and otherwise, sometimes do occur. EAO Switch Corporation accepts no responsibility for any loss, damage, or misinterpretation of content of this publication.

EAO — World Class Switching Products

ISO 9000 Quality Certification

EAO switches are designed for worldwide applications. All switching products are certified under ISO 9001 the most comprehensive of the ISO 9000 quality programs encompassing design/development, manufacturing, product installation, and customer service. This international standard of excellence is recognized by more than 90 countries, will become a requirement for selling to certain industries in the EC beginning in 1993, and is being adopted by key U.S. government agencies and OEMs. ISO 9000 certification offers an ongoing quality assurance system recognized the world over and is essential for firms marketing products worldwide. In addition, EAO offers a broad line of international approvals covering industry standards for most countries including stringent adherence to IEC testing procedures.

EAO — Your source for great products

As a manufacturer of quality, high reliability switches and indicators for instrument and industrial applications, EAO Switch Corporation offers the broadest line of commercial lighted products in the world. Switching elements are available in snap action and low level. Many series offer matching indicators, buzzers, flashers, and key-actuated elements, and all are produced from the finest materials, carefully assembled, and 100% tested. EAO quality is unsurpassed.

EAO — Your source for great performance

Whether your application requires instrument-grade switches or heavy duty oil and watertight units, EAO can fill your requirements without compromise. All EAO switches have the "feel" of quality. They are available with a variety of light sources, some with split screen and two-lamp redundancy, and offer many legend options, such as film inserts and engraving. Lenses and lamps are all front-panel replaceable. Lamps do not travel with switch action, contributing to long lamp life. Illumination is uniform, with no halo or hot spots. Round, square, and rectangular bezels are available, and most can be mounted in a round hole, eliminating the need for special punches.

EAO — Your source for great service

EAO is represented by a complete network of sales offices and authorized local distributors, backed by an average of three months of factory stock. Most standard stock items are shipped within 48 hours. EAO parts are also available worldwide, with representation in 30 countries, under the same part numbers for ease in filling replacement needs.

EAO Switches are ideally suited for applications in:

- ☐ General instrumentation
- ☐ Medical equipment
- ☐ Computers and computer peripherals
- ☐ Broadcast equipment
- ☐ Communications equipment
- ☐ Process control systems
- ☐ Electronic scales
- ☐ Security systems
- ☐ Machinery
- ☐ Robotics












The "Feel of Quality"

All EAO switches provide an outstanding tactile quality with no hesitation or roughness in operation. Maintained action switches are position-indicating for visual confirmation of status.

All EAO sales offices and distributors are ready to offer technical assistance, evaluation samples, quotes, and delivery of your quantity requirements.



EAO's International Approvals

Country/ Agency	Symbol	Approval	Product Series																			18/70 84/92 96/97 99
			01	02	03	04	11	14	15	19	21	22	30	31	32	41	51	52	61			
																			61	Emerg Stop		
United States/ UL	 or UND. LAB INC. LIST	Standard 1054	✓	✓	✓		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
		Standard 508				✓																
Canada/ CSA		Specification C22.2	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
West Germany/ VDE		Regulation VDE 0110, 0630, 0710, Limited Approval				✗	✗	✓	✓		✓	✓		✗	✓	✗	✗	✓	✗	✓		
		VDE Unlimited		✓	✓	○	○					✓		○		○	○		✓			
German Lloyd		Suitable for Limited Applications	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓		✓	✓		✗			
Switzerland/ SEV			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓		
Austria/ OVE			✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓		○			
Denmark/ Demko			✓	✓	✓																	
Norway/ Nemko			✓	✓	✓	✓	✓				✓	✓		✓	✓				○			
Finland/ SFS			✓	✓	✓	✓		✓				✓		✓			✓		✗			
Sweden Semko												✓										
Iceland				✓	✓	✓		✓						✓								
England/ Lloyd's Register of Shipping			✓	✓	✓	✓	✓	✓			✓	✓		✓		✓	✓	✓				
Italy/CESI RINA						✓																
		RINA				✓						✓										
USSR/ Register of USSR			✓	✓	✓	✓	✓	✓				✓		✓		✓	✓		✗			
Other Approvals		German Marine SAK-Blatt - Nr.3337-	✓	✓	✓	✓																
		Tested to Mil-Spec 22885D															✓					

Printed circuit board and low level switches do not need approvals as usage is less than 42 V AC/DC

Printed circuit board and low level switches do not need approvals as usage is less than 42 V AC/DC.

KEY: ✓ = Switching components & indicators, ✗ = Switching components only, ○ = Indicators only

Quick Product Selection Guide

Series	Grade			Maximum Rating		Switch Element	
	Instru- ment	Heavy Duty	Oil & Water Tight	AC	DC	Snap Action	Low Level
01	✓			250 V/5 A (P.F. = 1) 250 V/3 A (P.F. = 0.3)	220 V/0.1 A 24 V/2 A	✓	✓
02		✓		380 V/10 A (P.F. = 0.3) 250 V/10 A UL	220 V/0.2 A 24 V/6 A	✓	
03		✓		380 V/10 A (P.F. = 0.3) 250 V/10 A UL	220 V/0.2 A	✓	
04		✓	✓	600 V/10 A UL HD Rated 300 V/10 A CSA	220 V/0.5 A 24 V/10 A	✓	✓
11	✓			250 V/5 A (P.F. = 1) 250 V/3 A (P.F. = 0.3)	220 V/0.1 A 24 V/2 A	✓	✓
14	✓		✓	250 V/5 A (P.F. = 1) 250 V/3 A (P.F. = 0.3)	220 V/0.1 A 24 V/2 A	✓	✓
15	✓			250 V/5 A (P.F. = 1) 250 V/3 A (P.F. = 0.3)	220 V/0.1 A 24 V/2 A	✓	✓
18	✓			42 V/100 mA	42 V/100 mA	✓	✓
19	✓			50 V/2 A	72 V/2 A	✓	✓
21	✓			250 V/5 A (P.F. = 1) 250 V/3 A (P.F. = 0.3)	220 V/0.1 A 24 V/2 A	✓	✓
22		✓	✓	380 V/10 A	220 V/0.2 A 24 V/6 A	✓	
30	✓			250 V/5 A (P.F. = 1) 250 V/3 A (P.F. = 0.3)	220 V/0.1 A 24 V/2 A	✓	✓
31	✓			250 V/5 A (P.F. = 1) 250 V/3 A (P.F. = 0.3)	220 V/0.1 A 24 V/2 A	✓	✓
32	✓			250 V/5 A (P.F. = 1) 250 V/3 A (P.F. = 0.3)	220 V/0.1 A 24 V/2 A	✓	
41	✓			250 V/5 A (P.F. = 1) 250 V/3 A (P.F. = 0.3)	220 V/0.1 A 24 V/2 A	✓	✓
51	✓		✓	250 V/5 A (P.F. = 1) 250 V/3 A (P.F. = 0.3)	220 V/0.1 A 24 V/2 A	✓	✓
52	✓		✓	250 V/5 A (P.F. = 1) 250 V/3 A (P.F. = 0.3)	220 V/0.1 A 24 V/2 A	✓	✓
61	✓		✓	250 V/6 A (P.F. = 1) 250 V/2 A (P.F. = 0.7)	220 V/0.5 A 24 V/6 A	✓	✓
70	✓			42 V/50 mA	42 V/50 mA		✓
84	✓		✓	42 V/100 mA	42 V/100 mA		✓
92	✓		✓	42 V/50 mA	42 V/50 mA		✓
96	✓		WASHABLE	42 V/100 mA 3 VA maximum	42 V/100 mA 3 VA maximum		✓
97	✓			42 V/100 mA	42 V/100 mA		✓
99	✓			42 V/100 mA	42 V/100 mA		✓

* With use of vinyl cover. See Accessories section.

Product Types				Mounting		Terminals				Bezel			Illumination			Legends	
Push-Button	Key Lock	Indicator	Buzzer	Round Hole	Square or Rect. Hole	Solder	Quick Connect	PC Board	Screw	Round	Square	Rectangular	Incan-descent	LED	Neon	Engrav-ed	Film
✓		✓		✓		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
✓	✓	✓	✓		✓		✓		✓			✓	✓	✓	✓	✓	✓
✓	✓	✓	✓		✓		✓		✓			✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓		✓	✓		✓	✓	✓		✓	✓	✓	✓	✓
✓		✓		✓		✓	✓	✓		✓			✓	✓		✓	✓
✓	✓	✓	✓	✓		✓	✓	✓		✓			✓	✓	✓	✓	✓
	✓			✓		✓	✓	✓		✓							
✓		✓		✓		✓	✓			✓	✓	✓		✓		✓	
✓		✓		✓		✓	✓			✓	✓		✓	✓		✓	✓
✓				✓		✓	✓	✓		✓							
✓	✓	✓			✓		✓		✓			✓	✓	✓		✓	✓
✓	✓	✓			✓	✓	✓	✓				✓	✓	✓		✓	✓
✓	✓	✓	✓	✓		✓	✓	✓ With conn.		✓	✓	✓	✓	✓		✓	✓
	✓			✓			✓			✓	✓	✓					
✓		✓			✓	✓	✓	✓				✓	✓	✓		✓	✓
✓	✓	✓		✓		✓	✓	✓		✓	✓	✓	✓	✓		✓	✓
				✓		✓	✓	✓ With conn.		✓	✓		✓	✓			
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✓				✓				✓						✓			
✓		✓		✓		#	✓	✓		✓			✓	✓		✓	
✓		✓		✓				✓			✓			✓		✓	✓
✓		✓			PCB			✓			✓	✓		✓		✓	✓
✓		✓			PCB			✓		✓	✓			✓		✓	✓
✓	✓	✓			PCB			✓			✓	✓	✓	✓		✓	✓

Available with ribbon cable termination

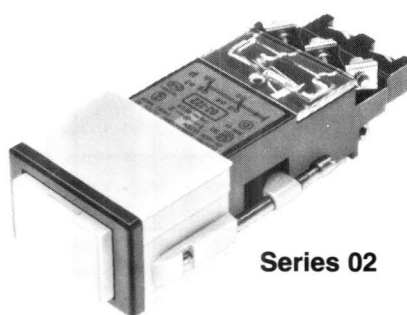
General Purpose Pushbutton Switches and Indicators

General purpose pushbutton switches and indicators are designed for use in a wide variety of applications, ranging from low level to power operations, that do not require special construction for environmental protection such as the switches listed in the oil & watertight section of this catalog. EAO general purpose switches and indicators combine outstanding dependability and quality with low cost.

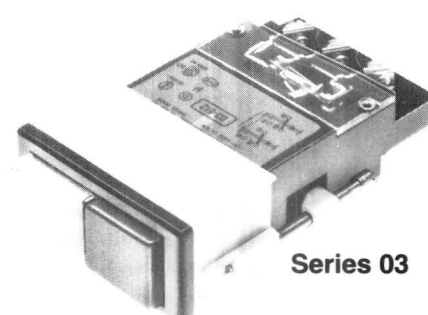
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■ Series 31	
16 mm Panel Hole Mounting	9
■ Series 41	
Two-lamp Pushbuttons and Indicators	11
■ Series 18	
Miniature 9 mm Pushbuttons and Indicators	13
■ Series 19	
Miniature 9 mm Pushbuttons and Indicators	14
■ Series 11/21	
Rear Mounted Pushbuttons and Indicators	15
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10 Amp Power Switches	17



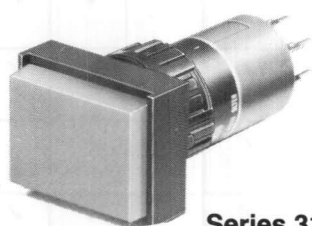
Series 01



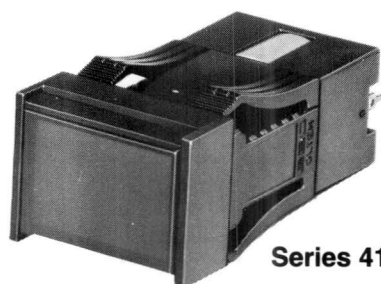
Series 02



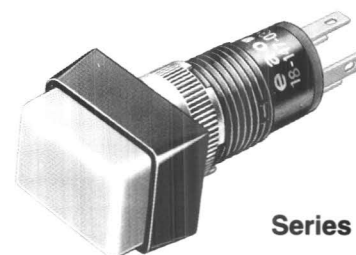
Series 03



Series 31



Series 41



Series 18



Series 19



Series 11



Series 21

General Purpose Pushbutton Switches and Indicators

Series 01

Multi-purpose 16 mm pushbuttons

FEATURES

- 250 VAC/5 A, 220 VDC/0.1 A, 24 VDC/2 A snap action
42 VAC/0.1 A, 42 VDC/0.1 A low level
- Minimum depth: 1.34"
- Front panel replaceable lens and lamp
- Incandescent lamp, neon, or LED
- Combined momentary/maintained action available

Series 01 Lighted Pushbuttons

(Order lens and lamp separately)

Momentary

Switch Element	Rectangular	Square	Round
Snap Action			
1-pole Form Z	01-121.0 □ □	01-151.0 □ □	01-131.0 □ □
2-pole Form Z	01-122.0 □ 5	01-152.0 □ 5	01-132.0 □ 5
3-pole Form Z	01-123.0 □ 5	01-153.0 □ 5	01-133.0 □ 5
4-pole Form Z	01-124.0 □ 5	01-154.0 □ 5	01-134.0 □ 5
Low Level			
2 N.O. contacts	01-421.036	01-451.036	01-431.036
2 N.C. contacts	01-422.036	01-452.036	01-432.036
1 N.O., 1 N.C.	01-423.036	01-453.036	01-433.036
1 N.O. contact	01-425.036	01-455.036	01-435.036
1 N.C. contact	01-426.036	01-456.036	01-436.036

Maintained

Switch Element	Rectangular	Square	Round
Snap Action			
1-pole Form Z	01-261.0 □ □	01-281.0 □ □	01-271.0 □ □
2-pole Form Z	01-262.0 □ 5	01-282.0 □ 5	01-272.0 □ 5
3-pole Form Z	01-263.0 □ 5	01-283.0 □ 5	01-273.0 □ 5
4-pole Form Z	01-264.0 □ 5	01-284.0 □ 5	01-274.0 □ 5
Low Level			
2 N.O. contacts	01-461.036	01-481.036	01-471.036
2 N.C. contacts	01-462.036	01-482.036	01-472.036
1 N.O., 1 N.C.	01-463.036	01-483.036	01-473.036
1 N.O. contact	01-465.036	01-485.036	01-475.036
1 N.C. contact	01-466.036	01-486.036	01-476.036

Combined Momentary/Maintained

Switch Element	Rectangular	Square	Round
Snap Action, Form Z			
Momentary 1PDT and Maintained 1PDT	01-101.0 □ 5	01-104.0 □ 5	01-107.0 □ 5
Momentary 1PDT and Maintained 2PDT	01-102.0 □ 5	01-105.0 □ 5	01-108.0 □ 5
Momentary 2PDT and Maintained 1PDT	01-103.0 □ 5	01-106.0 □ 5	01-109.0 □ 5

.0 □ □ Select contact and terminal type where applicable
1st digit is always 0 (Case color is black)
Contact material (2nd digit): 1 = Silver, 2 = Gold over silver
Terminal type (3rd digit): 2 = 0.110" Q.C., 5 = Solder

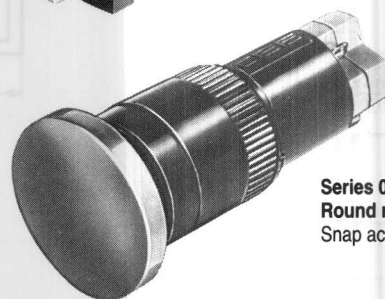
Reference

International Approvals	page 3
Oil & watertight versions	page 20
Accessories	page 82
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Legends	page 100
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To order: first select switch or indicator desired, indicating contact and terminal type when applicable. Then order lens and illumination separately.



Series 01
Square pushbutton
low level switch elements



Series 01
Round mushroom Cap
Snap action switch elements

Lighted Indicator

(Order lens and lamp separately)

Description	Rectangular	Square	Round
For 0.110" Q.C. terminals	01-040.002	01-050.002	01-030.002
Solder terminals	01-040.005	01-050.005	01-030.005
Length matches low level, universal terminals	01-041.006	01-051.006	01-031.006

Lenses/Mushroom Caps

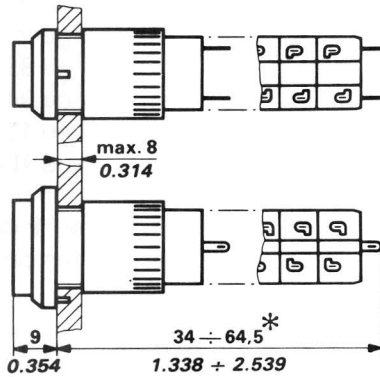
□ Select color

Description	Rect.	Square	Round	0	1	2	3	4	5	6	7	8	9
Flat Lens													
Translucent	01-901. □	01-951. □	01-931. □	✓		✓	✓	✓	✓	✓		✓	✓
Transparent	01-982. □	01-985. □	01-983. □			✓	✓	✓	✓	✓	✓		
Transparent with clear diffuser	01-972. □	01-975. □	01-973. □			✓		✓	✓		✓		
Mushroom Cap, opaque	01-930. □	01-952. □	01-932. □	✓		✓		✓	✓				

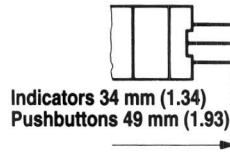
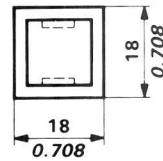
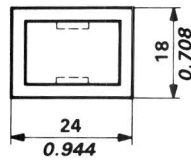
□ 0 = Black, 1 = Solar Black, 2 = Red, 3 = Orange, 4 = Yellow, 5 = Green, 6 = Blue
7 = Clear, 8 = Gray, 9 = White. Black and Gray are opaque.

General Purpose Pushbutton Switches and Indicators

Series 01 Dimensions & Mounting Information

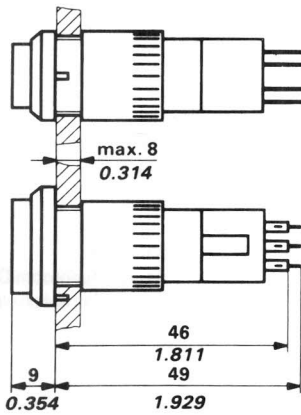


Snap action switch elements

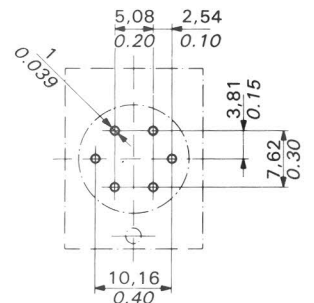
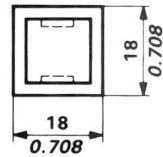
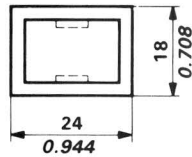


Quick-connect terminal
2.8 mm (0.110)

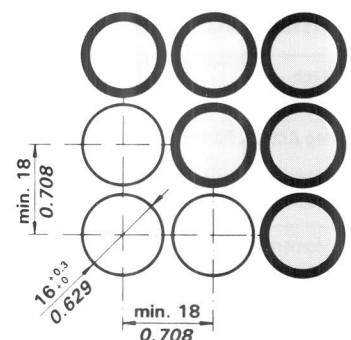
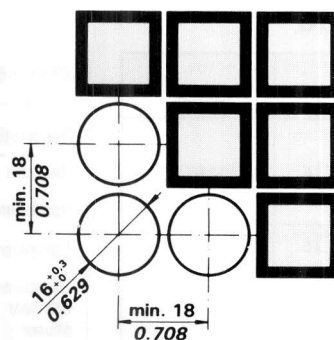
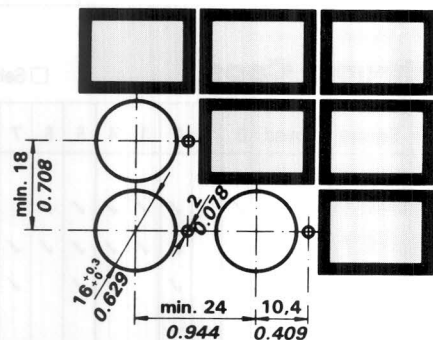
* Indicator, 34 (1.34)
1 pole, 42 (1.65)
2 pole, 49.5 (1.95)
3 pole, 57 (2.24)
4 pole, 64.5 (2.57)



Low level switch elements



P.C.-board layout
solder side of circuit path



General Purpose Pushbutton Switches and Indicators

Series 31

Multi-purpose 16 mm pushbuttons

FEATURES

- 250 VAC/5A, 220 VDC/0.1 A, 24 VDC/2 A snap action
42 VAC/0.1 A, 42 VDC/0.1 A low level
- Minimum depth: 1.14"
- Front panel replaceable lens and lamp
- Incandescent lamp or LED

Reference

International Approvals	page 3
Oil & watertight versions	page 20
Accessories	page 82
Lamps	page 94
Legends	page 100
Technical Specifications	page 104

To order: first select switch or indicator desired, indicating contact and terminal type when applicable. Then order lens and illumination separately.

Lighted Pushbuttons

(Order lamp and lens separately)

Momentary

Switch Element	Rectangular	Square	Round
Snap Action			
1-pole Form Z	31-121.0 □ □	31-151.0 □ □	31-131.0 □ □
2-pole Form Z	31-122.0 □ 5	31-152.0 □ 5	31-132.0 □ 5
3-pole Form Z	31-123.0 □ 5	31-153.0 □ 5	31-133.0 □ 5
4-pole Form Z	31-124.0 □ 5	31-154.0 □ 5	31-134.0 □ 5
Low Level			
2 N.O. contacts	31-421.036	31-451.036	31-431.036
2 N.C. contacts	31-422.036	31-452.036	31-432.036
1 N.O., 1 N.C.	31-423.036	31-453.036	31-433.036
1 N.O. contact	31-425.036	31-455.036	31-435.036
1 N.C. contact	31-426.036	31-456.036	31-436.036

Maintained

Switch Element	Rectangular	Square	Round
Snap Action			
1-pole Form Z	31-261.0 □ □	31-281.0 □ □	31-271.0 □ □
2-pole Form Z	31-262.0 □ 5	31-282.0 □ 5	31-272.0 □ 5
3-pole Form Z	31-263.0 □ 5	31-283.0 □ 5	31-273.0 □ 5
4-pole Form Z	31-264.0 □ 5	31-284.0 □ 5	31-274.0 □ 5
Low Level			
2 N.O. contacts	31-461.036	31-481.036	31-471.036
2 N.C. contacts	31-462.036	31-482.036	31-472.036
1 N.O., 1 N.C.	31-463.036	31-483.036	31-473.036
1 N.O. contact	31-465.036	31-485.036	31-475.036
1 N.C. contact	31-466.036	31-486.036	31-476.036

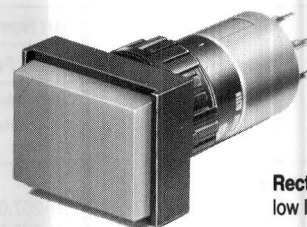
Select contact and terminal type where applicable

.0 □ □

1st digit is always 0 (Case color is black)

Contact material (2nd digit): 1 = Silver, 2 = Gold over silver

Terminal type (3rd digit): 2 = 0.110" Q.C., 5 = Solder



Rectangular pushbutton,
low level switch element



Round pushbutton,
snap action switch elements

Lighted Indicator

(Order lens and lamp separately)

Description	Rectangular	Square	Round
For 0.110" Q.C. terminals	31-040.002	31-050.002	31-030.002
Solder terminals	31-040.005	31-050.005	31-030.005
Length matches low level universal terminals	31-041.006	31-051.006	31-031.006

Lenses

□ Add color digit

Description	Rect.	Square	Round	0	1	2	3	4	5	6	7	8	9
Flat Lens													
Translucent	31-901.□	31-951.□	31-931.□	✓		✓	✓	✓	✓	✓		✓	✓
Transparent	31-903.□	31-953.□	31-933.□		✓	✓	✓	✓	✓	✓	✓		
Transparent with clear diffuser	31-905.□	31-955.□	31-935.□			✓		✓	✓		✓		
Concave													
Translucent	31-902.□	31-952.□	--	✓		✓	✓	✓	✓	✓		✓	✓
Transparent	31-904.□	31-954.□	--			✓	✓	✓	✓	✓	✓		
Transparent with clear diffuser	31-906.□	31-956.□	--			✓		✓	✓		✓		

□ 0 = Black, 1 = Solar Black*, 2 = Red, 3 = Orange, 4 = Yellow, 5 = Green, 6 = Blue
7 = Clear, 8 = Gray, 9 = White. Black and Gray are opaque.

* Dead front — legend only visible when illuminated.

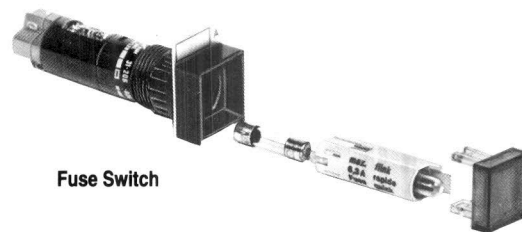
General Purpose Pushbutton Switches and Indicators

Series 31 Fuse Switch

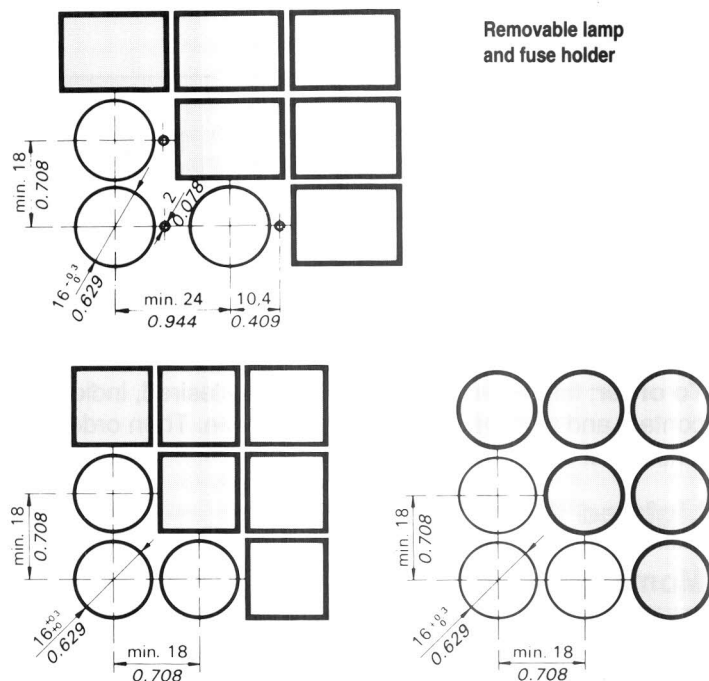
Combination lighted pushbutton switch and fuse

(Order lens, lamp, and fuse separately)

Description	Part Number		
	Internal Lamp and Fuse Connections		
	Lamp and fuse have separate terminals	Lamp and fuse share 1 common terminal	Lamp and fuse paralleled to same terminals
For 6-60 V incandescent lamp 1 pole switch 2 pole switch	31-201.025 31-202.025	31-207.025 31-208.025	31-213.025 31-214.025
Fuseholders are for 5 x 20 mm 250 V fuses, quick blow only, 6.3 amp maximum. Pushbuttons are maintained action. Switches are snap action, 250 V AC, 5 A, 1 or 2 pole. Overall length: 1 pole switch: 2.2 inches 2 pole switch: 2.5 inches			
	Independent lamp and fuse circuits. For general purpose and development use.	One terminal common to lamp and fuse. Saves connections where lamp is to light when fuse is energized.	Lamp & fuse internally connected in parallel. Lamp lights when fuse blows, if current is at least 2/3 of nominal lamp current.
Fuse legend plate 18 x 24 mm, self-adhesive	31-999		
Fuse quick blow 5 x 20 mm 250 V	1 A 2 A 3 A 4 A 5 A 6.3 A	31F-1 31F-2 31F-3 31F-4 31F-5 31F-6.3	

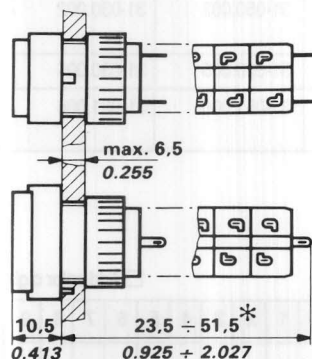


Fuse Switch

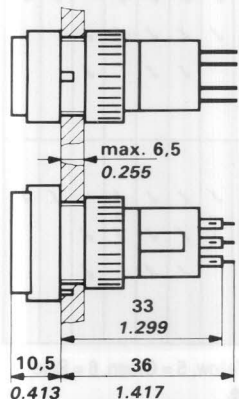


Removable lamp and fuse holder

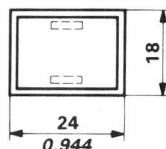
Dimensions & Mounting Information



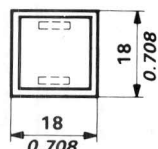
Snap action switch elements



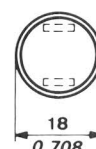
Low level switch elements



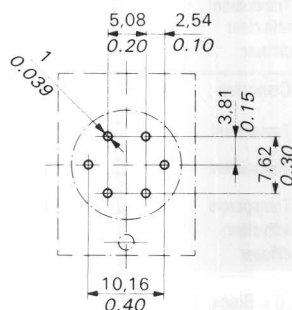
Indicators 26 mm
Pushbuttons 36 mm



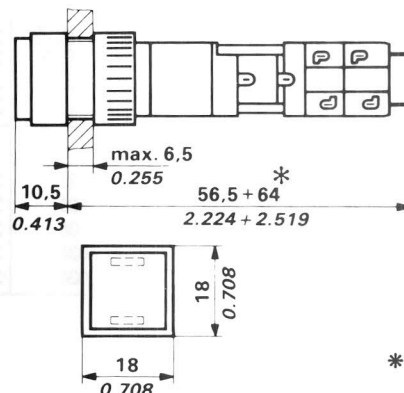
Quick-connect terminal
2,8 mm (0.110)
(1.023)
(1.417)



* Indicator, 23.5 (0.925)
1 pole, 29 (1.14)
2 pole, 36.5 (1.44)
3 pole, 44 (1.73)
4 pole, 51.5 (2.03)



P.C.-board layout
solder side of circuit path



Lighted pushbutton with fuse

* 1 pole, 56.5 (2.22)
2 pole, 64 (2.52)

General Purpose Pushbutton Switches and Indicators

Series 41

Two-Lamp Lighted Pushbuttons and Indicators

FEATURES

- 250 VAC/5 A, 220 VDC/0.1 A, 24 VDC/2 A snap action
42 VAC/0.1 A, 42 VDC/0.1 A low-level
- Minimum depth: 1.44"
- Snap-in mounting, panels to 0.118" thick
- Choice of single or split lens
- Excellent tactile feel
- Front panel replaceable lens and lamp
- Stationary lamp for long life

Reference

International Approvals	page 3
Oil & watertight versions	page 20
Accessories	page 82
Lamps	page 94
Legends	page 100
Technical Specifications	page 104

To order: first select switch or indicator desired, indicating contact and terminal type when applicable. Then order lens and illumination separately.

Lighted Pushbuttons & Indicators

(Order lens and lamps separately)

Switch Element	Momentary	Maintained
Snap Action		
1-pole Form Z	41-121.0 □ 5	41-261.0 □ 5
2-pole Form Z	41-122.0 □ 5	41-262.0 □ 5
3-pole Form Z	41-123.0 □ 5	41-263.0 □ 5
4-pole Form Z	41-124.0 □ 5	41-264.0 □ 5
Low Level		
2 N.O. contacts	41-421.036	41-461.036
2 N.C. contacts	41-422.036	41-462.036
1 N.O., 1 N.C. contact	41-423.036	41-463.036
Indicator		
Solder connection	41-040.005	
Length to match low level, Universal terminations	41-041.006	

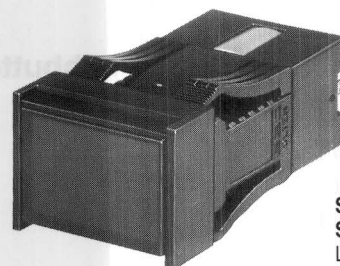
Select contact and terminal type where applicable

.0 □ □

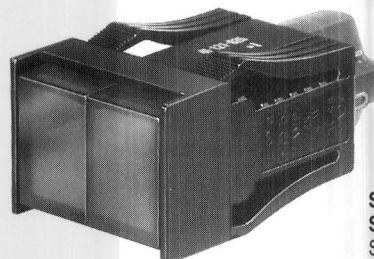
1st digit is always 0 (Case color is black)

Contact material (2nd digit): 1 = Silver, 2 = Gold over silver

Terminal type (3rd digit): 5 = Solder, 6 = 0.078" Q.C.



Series 41
Single lens
Low level



Series 41
Split lens
Snap action

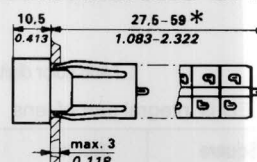
Lenses

□ Add color digit

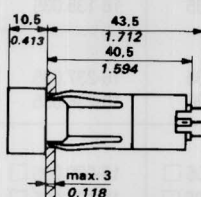
Description	Part Number
Lens, flat, transparent	
single color	41-903. □
split lens (choose 2 colors)	41-907. □ / □
Lens, flat, transparent	
single color	41-904. □
with transparent diffuser	split lens (choose 2 colors)
for LED use	41-908. □ / □

□ Select color(s): 2 = Red, 3 = Orange, 4 = Yellow, 5 = Green, 6 = Blue*, 7 = Clear
* 41-903 and 41-907 only.

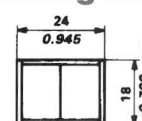
Dimensions & Mounting Information



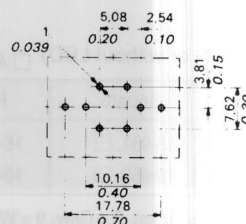
Indicator, Pushbutton
Snap acting switch elements



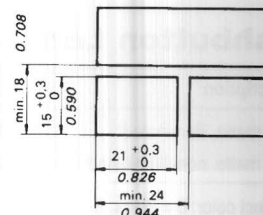
Indicator, Pushbutton
Low level switch elements



* Indicator, 27.5 (1.08)
1 pole, 36.5 (1.44)
2 pole, 44 (1.73)
3 pole, 51.5 (2.03)
4 pole, 59 (2.32)



P.C. board layout
solder side of circuit path



Mounting holes

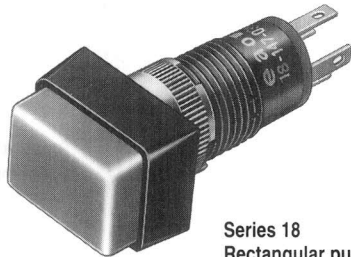
General Purpose Pushbutton Switches and Indicators

Series 18

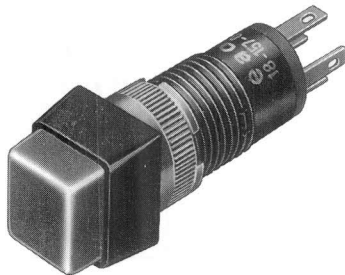
Miniature Illuminated 8 mm Pushbutton Switches & Indicators

FEATURES

- 100 μ V/10 μ A to 42 V AC/DC @ 100 mA
- Minimum depth: 0.906"
- LED illumination is integrated into the lens
- Meet IP40 specifications
- Maintained or momentary action
- Two flush mount styles available



Series 18
Rectangular pushbutton



Series 18
Square pushbutton



Series 18
Round pushbutton

Reference

Oil & watertight versions	page 20
Accessories	page 82
Lamps	page 94
Technical Specifications	page 104

To order: first select pushbutton or indicator desired. Since indicator comes complete with lens and integral LED, indicate color. For pushbutton, order lens and integral LED separately.

Series 18

Flush mount pushbuttons and indicators

Series 18 pushbutton switches and indicators also can be obtained in a square bezel flush mount package. Indicators for flush mounting come complete with lens and LED; simply order the adapter separately. For flush mount pushbuttons, you must order the correct lens (with or without LED) and the adapter. Both square and round flush mount adapters units feature a square black bezel that mounts in a 16 mm square panel opening.

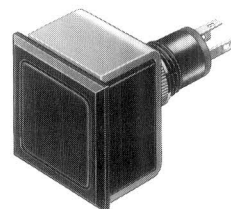
Also available is a new round bezel flush mount adapter that mounts in a standard 16 mm round hole. Simply order a standard round pushbutton and lens (with or without LED) and the adapter. It is attractive and easy to install.

Lighted Pushbuttons & Indicators

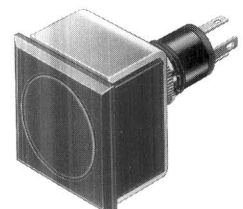
☐ Add color digit

Order pushbutton lens separately. If lighted, LED is integral part of lens

Description	Rectangular	Square	Round
Momentary			
1 N.O. contact	18-147.035	18-157.035	18-137.035
1 N.C. contact	18-148.035	18-158.035	18-138.035
Maintained			
1 N.O. contact	18-247.035	18-257.035	18-237.035
1 N.C. contact	18-248.035	18-258.035	18-238.035
Indicator with lens & LED			
2.2 VDC	18-040.005 <input type="checkbox"/>	18-050.005 <input type="checkbox"/>	18-030.005 <input type="checkbox"/>
12 VDC	18-041.005 <input type="checkbox"/>	18-051.005 <input type="checkbox"/>	18-031.005 <input type="checkbox"/>
24 VDC	18-042.005 <input type="checkbox"/>	18-052.005 <input type="checkbox"/>	18-032.005 <input type="checkbox"/>



Square pushbutton with
square bezel flush mount
adapter



Round pushbutton with
square bezel flush
mount adapter



Round pushbutton with
round bezel flush mount
adapter

Pushbutton Lenses (with or without LED) ☐ Add color digit

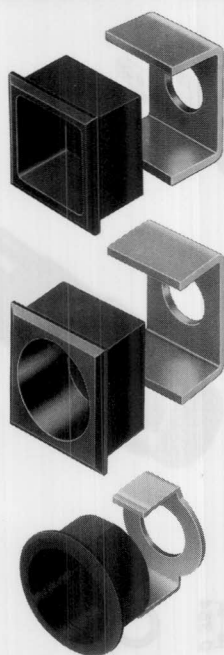
Description	Rectangular	Square	Round
Flat, matte, illuminated*	18-941. <input type="checkbox"/>	18-951. <input type="checkbox"/>	18-931. <input type="checkbox"/>
Flat, matte, non-illuminated	18-942. <input type="checkbox"/>	18-952. <input type="checkbox"/>	18-932. <input type="checkbox"/>

☐ Select color: 0 = Black, 2 = Red, 4 = Yellow, 5 = Green, 8 = Gray, 9 = White.

Only Red, Yellow, and Green available for illuminated lenses. Black and Gray are opaque.

* LED (2.2 V) is integral part of lens. Lens cannot be dismantled from indicator.

General Purpose Pushbutton Switches and Indicators



Square bezel flush mount adapter for square indicators and pushbuttons

Square bezel flush mount adapter for round indicators and pushbuttons

Round bezel flush mount adapter for round indicators and pushbuttons

Square Bezel Flush Mount Adapter

Description	Square	Round
Flush mount adapter	18-920.1	18-920.2

Flush Mount Pushbutton Lens for use with square bezel adapter

(with or without 2.2 V LED)

☐ Add color digit

Description	Square	Round
Flat, matte, illuminated*	18-981. <input type="checkbox"/>	18-961. <input type="checkbox"/>
Flat, matte, non-illuminated	18-982. <input type="checkbox"/>	18-962. <input type="checkbox"/>

☐ Color: 0 = Black, 2 = Red, 4 = Yellow, 5 = Green, 8 = Grey, 9 = White. *Only Red, Yellow, Green available for illuminated lens and indicators.

Lighted Pushbuttons and Indicators for use with square bezel adapter

Order pushbutton lens separately.

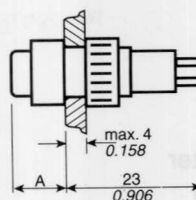
☐ Add color digit

Description	Square	Round
Momentary		
1 N.O. contact	18-187.035	18-167.035
1 N.C. contact	18-188.035	18-168.035
Maintained		
1 N.O. contact	18-287.035	18-267.035
1 N.C. contact	18-288.035	18-268.035
Indicator with lens & LED*		
2.2 VDC	18-080.005 <input type="checkbox"/>	18-060.005 <input type="checkbox"/>
12 VDC	18-081.005 <input type="checkbox"/>	18-061.005 <input type="checkbox"/>
24 VDC	18-082.005 <input type="checkbox"/>	18-062.005 <input type="checkbox"/>

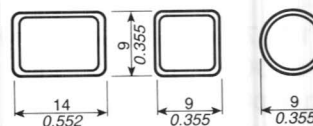
Round Bezel Flush Mount Adapter

Description	Part Number
Flush mount adapter	18-920.3

Dimensions & Mounting Information



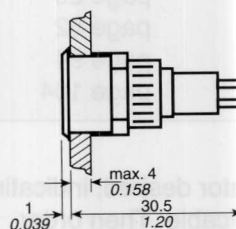
Pushbutton and indicator



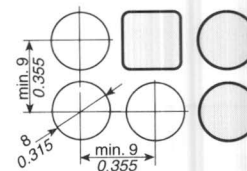
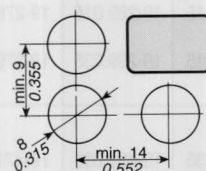
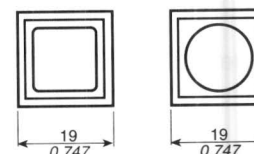
Dimension "A"

Pushbutton: 8.7 mm (0.343")

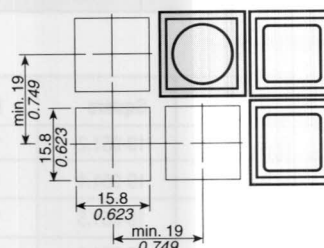
Indicator: 7.2 mm (0.284")



Pushbutton and indicator used with flush mount adapter



Mounting holes for pushbutton and indicator



Mounting holes for pushbutton and indicator used with flush mount adapter

General Purpose Pushbutton Switches and Indicators

Series 19

Miniature 8 mm Lighted Pushbuttons and Indicators

FEATURES

- 50 VAC/1 A, 72 VDC/1 A snap action
- 42 V AC or DC/100 mA low level
- Minimum depth: 1.30"
- Mounts as close as 0.354 inch on center
- Front panel replaceable lens and lamp
- Square or round 9 mm bezel

Reference

International Approvals	page 3
Oil & watertight versions	page 20
Accessories	page 82
Lamps	page 94
Technical Specifications	page 104

To order: first select switch or indicator desired, indicating contact and terminal type when applicable. Then order lens and illumination separately.

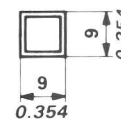
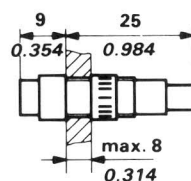
Lighted Pushbuttons & Indicators

(Order lens and lamp separately)

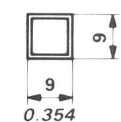
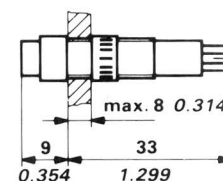
Switch Element	Momentary		Maintained	
	Square	Round	Square	Round
Snap Action				
1 N.O. contact Silver contact	19-159.015	19-139.015	19-289.015	19-279.015
1 N.O. contact Gold contact	19-159.035	19-139.035	19-289.035	19-279.035
Low Level				
1 N.O. contact	19-451.035	19-431.035	19-481.035	19-471.035
1 N.C. contact Gold contacts	19-452.035	19-432.035	19-482.035	19-472.035
Indicator	Square		Round	
Short version	19-050.005		19-030.005	
Standard length, to match pushbuttons	19-051.005		19-031.005	

Lenses

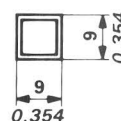
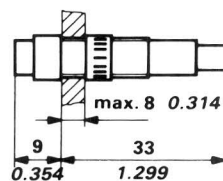
Description		Square	Round
Lens transparent with translucent lens holder (lamp)	Red	19-951.2	19-931.2
	Yellow	19-951.4	19-931.4
	Green	19-951.5	19-931.5
	Blue	19-951.6	19-931.6
	White	19-951.9	19-931.9
Lens transparent with clear lens holder (LED)	Red	19-952.2	19-932.2
	Yellow	19-952.4	19-932.4
	Green	19-952.5	19-932.5
	Blue	19-952.6	19-932.6
	Clear	19-952.7	19-932.7
Lens opaque for unlighted pushbutton	Black	19-951.0	19-931.0
	Gray	19-951.8	19-931.8



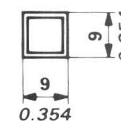
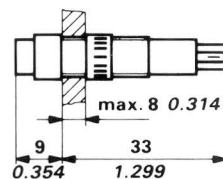
Indicator, Short version



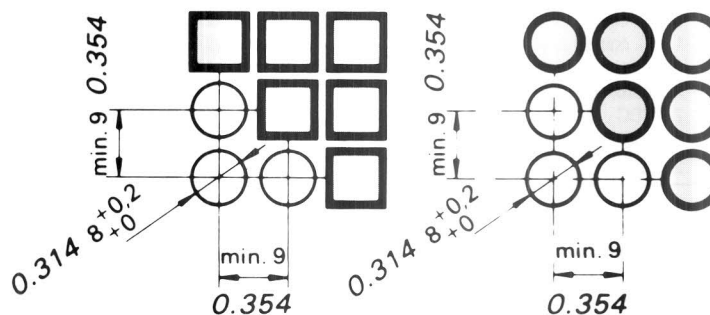
Pushbutton, Snap action switch element



Indicator



Pushbutton, Low level switch element



Mounting Holes

General Purpose Pushbutton Switches and Indicators

Series 11/21

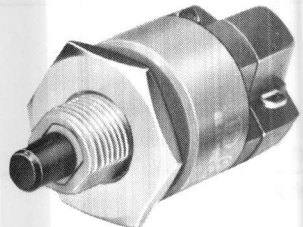
Rear Mounted Pushbuttons and Indicators

FEATURES

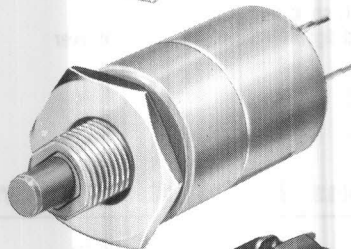
- 250 VAC/5 A, 220 VDC/0.1 A, 24 VDC/2 A snap action
42 VAC/0.1 A, 42 VDC/0.1 A low-level
- Minimum depth:
Series 11: 1.08"
Series 21: 0.944"
- Mounts in panels to 0.157 inch thick
- Choice of front panel mounting nut
- 5-million operations, low level
- Front panel replaceable lens and lamp



Series 11
pushbutton
low level



Series 21
pushbutton
snap action



Series 21
pushbutton
low level



Series 11
pushbutton
snap action

Reference	
International Approvals	page 3
Oil & watertight versions	page 20
Accessories	page 82
Lamps	page 94
Technical Specifications	page 104

To order: first select switch or indicator desired, indicating contact and terminal type when applicable. Then order lens and illumination separately.

Series 11

Lighted Pushbuttons & Indicators

(Order lens, lamp, and front mounting nut separately)

Switch Element	Momentary	Maintained
	Round	Round
Snap Action		
1-pole Form Z	11-131.8 □ □	11-271.8 □ □
2-pole Form Z	11-132.8 □ 5	11-272.8 □ 5
3-pole Form Z	11-133.8 □ 5	11-273.8 □ 5
4-pole Form z	11-134.8 □ 5	11-274.8 □ 5
Low Level		
1 N.O. contact	11-435.836	11-475.836
1 N.C. contact	11-436.836	11-476.836
2 N.O. contacts	11-431.836	11-471.836
2 N.C. contacts	11-432.836	11-472.836
1 N.O., 1 N.C. contact	11-433.836	11-473.836
Indicator		
Solder connection	11-030.805	
Length to match low level. Universal terminations	11-031.806	

Select contact and terminal type where applicable
.8 □ □
1st digit is always 8 (Case color is gray)
Contact material (2nd digit): 1 = Silver, 2 = Gold over silver
Terminal type (3rd digit): 2 = 0.110" Q.C., 5 = Solder

Lenses

□ Add color digit

Description	Round	0	1	2	3	4	5	6	7	8	9
Lens, with diffuser (lamp)	11-931. □	✓		✓		✓	✓	✓			✓
Lens, no diffuser (LED)	11-932. □			✓		✓	✓	✓	✓		

□ 0 = Black, 1 = Solar Black, 2 = Red, 3 = Orange, 4 = Yellow, 5 = Green, 6 = Blue
7 = Clear, 8 = Gray, 9 = White. Black and Gray are opaque.



Mounting Nuts

Description	Part Number
Rear mounting nut (included with switch)	11-934
Front mounting nut required (not included)	
A. Knurled, open face, bright chrome, ø 14 mm	11-935
B. Knurled, flat face, bright chrome, ø 14 mm	11-936
C. Knurled, conical face, bright chrome, ø 16 mm	11-937

General Purpose Pushbutton Switches and Indicators

Series 21

Unlighted Pushbuttons

(Order button and front mounting nut separately)



Switch Element	Momentary	Maintained
	Round	Round
Snap Action		
1-pole Form Z	21-131.8 □ 5	21-271.8 □ 5
2-pole Form Z	21-132.8 □ 5	21-272.8 □ 5
3-pole Form Z	21-133.8 □ 5	21-273.8 □ 5
Low Level		
1 N.O. contact	21-435.836	21-475.836
1 N.C. contact	21-436.836	21-476.836
2 N.O. contacts	21-431.836	21-471.836
2 N.C. contacts	21-432.836	21-472.836
1 N.O., 1 N.C. contact	21-433.836	21-473.836


Select contact material where applicable

.8 □ 5

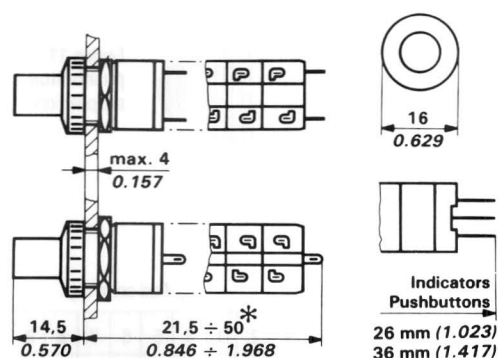
1st digit is always 8 (case color is gray)

Contact material (2nd digit): 1 = Silver, 2 = Gold over silver

Mounting Nuts & Buttons

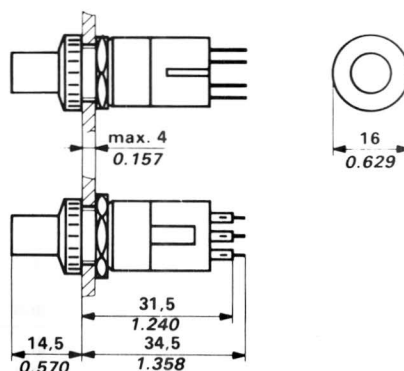
Rear mounting nut (included with switch)	21-934
Front mounting nut required (not included)	
A. Knurled, open face, bright chrome, ø 10 mm	21-935
B. Knurled, flat face, bright chrome, ø 10 mm	21-936
C. Knurled, conical face, bright chrome, ø 14 mm	21-937
Button	
	
Black	21-931.0
Red	21-931.2
Yellow	21-931.4
Green	21-931.5
Blue	21-931.6
White	21-931.9

Dimensions & Mounting Information

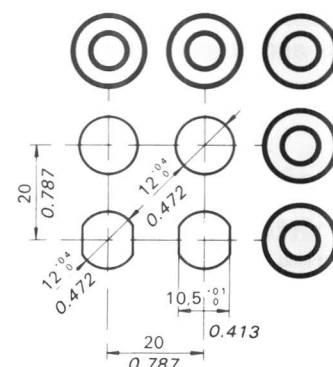


Indicator, 21.5 (0.846) 3 pole, 42.5 (1.67)
1 pole, 27.5 (1.08) 4 pole, 50 (1.97)
2 pole, 35 (1.38)

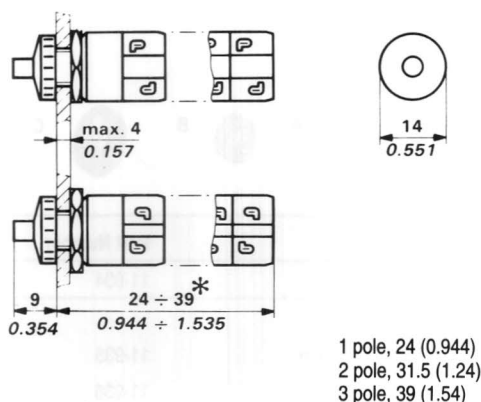
Series 11
Snap acting switch element



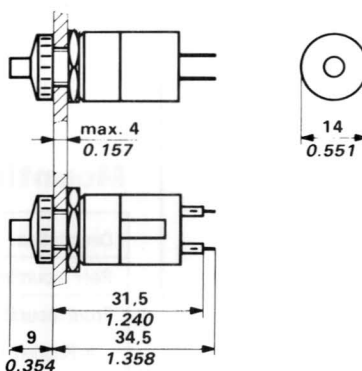
Series 11
Low level switch element



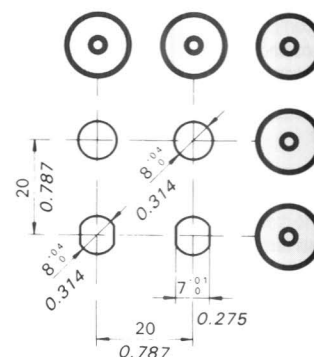
Series 11 mounting



Series 21
Snap action switch element



Series 21
Low level switch element



Series 21 mounting

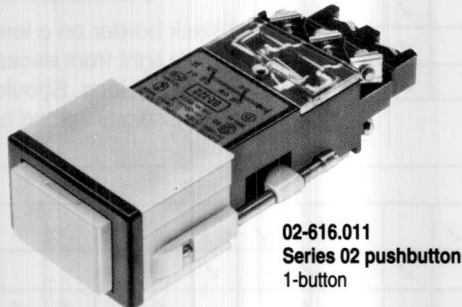
General Purpose Pushbutton Switches and Indicators

Series 02/03

10 Amp Power Switches and Indicators

FEATURES

- 380 VAC/10 A, 220 VDC/0.2 A, 24 VDC/6 A
- Minimum depth: 2.95"
- Rugged design for power applications
- Lighted or unlighted pushbuttons
- Two-lamp/split lens models (Series 03 only)
- Protection guards available
- Front panel replaceable lens and lamp
- Choice of lamps/neons/LEDs



Series 02

Pushbuttons & Indicators

(Order lens and lamp separately)

Description	Momentary	Maintained	Momentary/ Maintained
Lighted Pushbutton			
1-pole Form C	02-616.011	02-618.011	--
2-pole Form C	02-617.011	02-619.011	02-620.011
Unlighted Pushbutton			
1-pole Form C	02-611.011	02-613.011	--
2-pole Form C	02-612.011	02-614.011	02-615.011
Lighted Indicators			
Indicator, reduced length, 60 mm (2.362)			02-021.001
Indicator with resistor	220 V AC/DC		02-070.001
60 V, 20 mA lamp	110 V AC/DC		02-071.001
84 mm (3.307), length	125 V AC/DC		02-072.001
	220 V AC only (with diodes)		02-073.001

Lenses/Mushroom Caps

☐ Add color digit

Description	Part No.	0	1	2	3	4	5	6	7	8	9
Translucent, diffusing pattern on rear	02-901. <input type="checkbox"/>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Translucent, no diffusing pattern on rear	02-902. <input type="checkbox"/>			✓			✓		✓		
Film holder, translucent	02-908. <input type="checkbox"/>			✓	✓	✓	✓	✓	✓		✓
Mushroom caps*	02-930. <input type="checkbox"/>	✓		✓		✓	✓				
Hidden legend Opal Film	02-909	Place over film for effect									

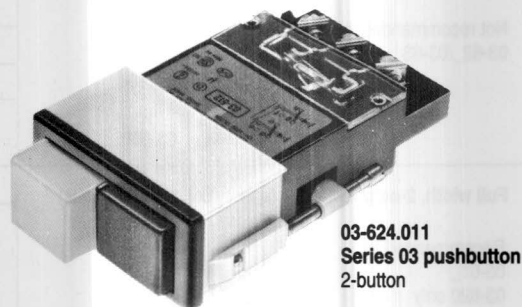
☐ Color: 0 = Black, 1 = Solar Black, 2 = Red, 3 = Orange, 4 = Yellow, 5 = Green, 6 = Blue, 7 = Clear, 8 = Gray, 9 = White. Black and Gray are opaque.

* Cannot use protection guards.

Reference

International Approvals	page 3
Oil & watertight versions	page 20
Accessories	page 82
Lamps	page 94
Legends	page 100
Technical Specifications	page 104

To order: First select switch or indicator desired. Then order lens/mushroom cap and illumination separately.



Series 03

Pushbuttons & Indicators


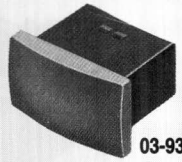
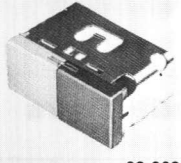
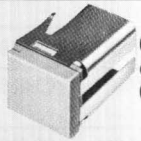
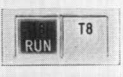

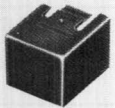
(Order lens and lamp separately)

Description	Momentary	Maintained	Momentary/ Maintained
Lighted Pushbutton			
1-button, 1-pole Form C	03-616.011	03-618.011	--
2-button, 1-pole Form C one side, indicator other side	03-627.011	03-628.011	--
1-button, 2-pole Form C	03-617.011	03-619.011	03-620.011
2-button, 2 independent poles Form C	03-624.011	03-625.011	03-626.011
2-button, 2-pole, interlocked Form C	03-630.011	03-631.011	03-632.011
Unlighted Pushbutton			
1-button, 1-pole Form C	03-611.011	03-613.011	--
1-button, 2-pole Form C	03-612.011	03-614.011	03-615.011
2-button, 2 independent poles Form C	03-621.011	03-622.011	03-623.011
2-button, 2-pole, interlocked Form C	--	03-629.011	--
Lighted Indicators			
Indicator		03-021.001	

Protection guards are available in the Accessory section of this catalog. To install protection guards, existing flat bezel must be removed and protection guard inserted in its place.

General Purpose Pushbutton Switches and Indicators

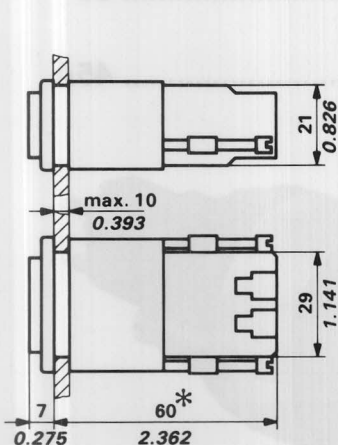
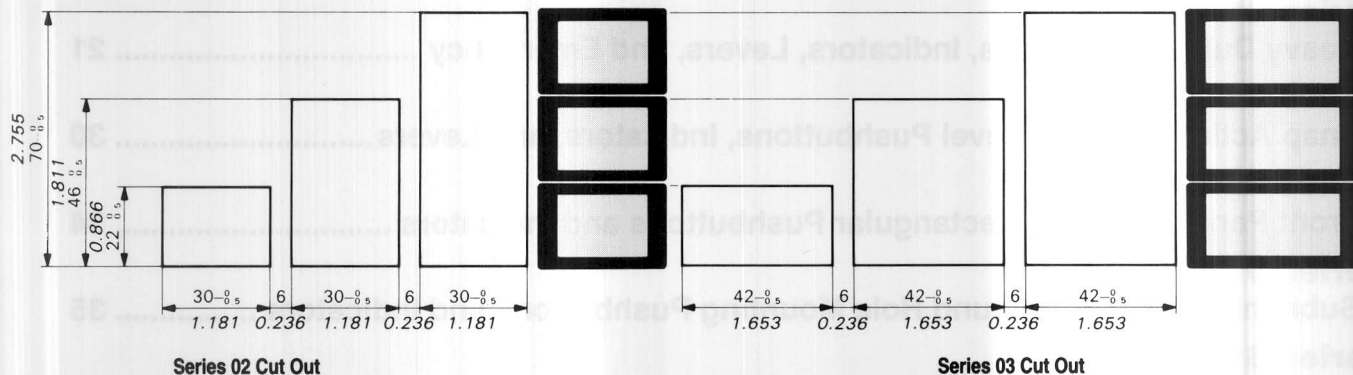
Series 03 Lenses & Mushroom Caps

Description	Part No.	Black border on lens face ¹	Opaque	Transparent*	Translucent	With diffuser pattern	<input type="checkbox"/> Add color digit: 0 = Black, 1 = Solar Black ² , 2 = Red, 3 = Orange, 4 = Yellow, 5 = Green, 6 = Blue, 7 = Clear, 8 = Gray, 9 = White. Black and Gray are opaque.									
							0	1	2	3	4	5	6	7	8	9
Full width, 1-segment Lens Recommended for: 03-61_ 03-620 only Indicators  03-901. <input type="checkbox"/> Not recommended for: 03-62_/03-63_  03-930. <input type="checkbox"/>	03-901. <input type="checkbox"/>		✓				✓								✓	
				✓		✓		✓						✓		
					✓	✓			✓	✓	✓	✓	✓			✓
	03-930. <input type="checkbox"/>		✓				✓		✓		✓	✓				
	03-941.7			✓			¹ Black border on a lens will prevent lateral light from escaping from the sides of a lens. Should be used in dark or dimly lighted areas.									
	03-946.7	✓		✓												
	03-947.1	✓		✓												
Full width, 2-segment Lens (specify color combinations) Recommended for: 03-61_ 03-620 only Indicators  03-902. <input type="checkbox"/>	03-902. <input type="checkbox"/> <input type="checkbox"/>		✓				✓								✓	
				✓		✓		✓						✓		
					✓	✓			✓	✓	✓	✓	✓			✓
	03-942.7/7			✓			² Solar Black lens will hide a film legend until the lens is illuminated.									
	03-951.7/7	✓		✓												
	03-952.1/1	✓		✓												
Half Width Lens Plastic lens, metal base  03-921. <input type="checkbox"/> or 03-943.7 Two per switch for: 03-62_ only  03-953.7 or  03-954.1 Except interlocks	03-921. <input type="checkbox"/>		✓				✓								✓	
				✓		✓		✓						✓		
					✓	✓			✓	✓	✓	✓	✓			✓
	03-943.7			✓			To obtain hidden legend effect: use opal film for 03-943 or 03-953, solar lens for 03-954.									
	03-953.7	✓		✓												
	03-954.1	✓		✓												
Half Width Lens All plastic  03-923. <input type="checkbox"/> For interlocks only	03-923. <input type="checkbox"/>		✓				✓								✓	
				✓		✓								✓		
					✓	✓			✓	✓	✓	✓	✓			✓
*Transparent lenses without diffusing pattern can be used for film insertion. See Film Holders.																
Film Holders/Hidden Legend Film																
Film Holder, Full Width For type 03-901, 03-941, 03-946, and 03-947 lenses	03-908. <input type="checkbox"/>			✓											✓	
					✓				✓	✓	✓	✓	✓			✓
Film Holder, Half Width For type 03-902, 03-942, 03-951, 03-952, 03-921, 03-943, 03-953, and 03-954 lenses. Two per switch.	03-922. <input type="checkbox"/>			✓											✓	
					✓				✓	✓	✓	✓	✓			✓
Hidden Legend Opal Film (need filmholder) Full Width for type 03-941, 03-946, 03-947 lenses	03-909	Opal film, if placed over a film legend, will hide the legend until the lens is illuminated														
	03-926															
Half Width for type 03-942, 03-951, 03-952, 03-943, 03-953, and 03-954 lenses																

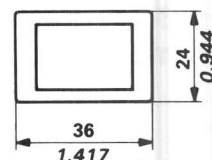
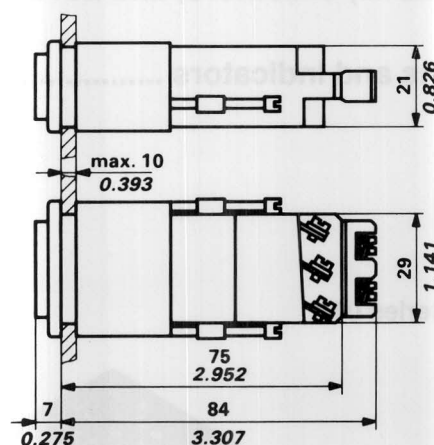
General Purpose Pushbutton Switches and Indicators

Series 02/03 Dimensions & Mounting Information

Vertical spacing between cutouts: 6 mm (0.236). For two pole switches, a horizontal spacing of 4 mm (0.158) must be maintained or a terminal cover must be used if spacing is less. Not necessary if voltage is low.

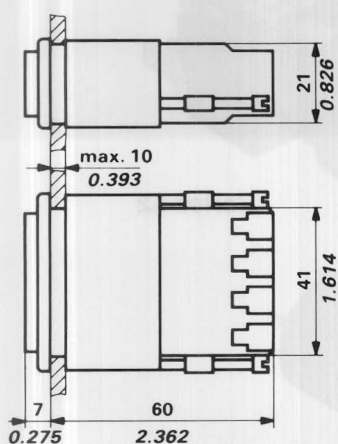
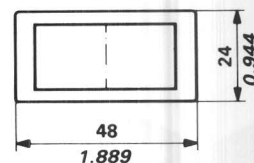


* 84 mm (3.07) for indicators with built-in resistor

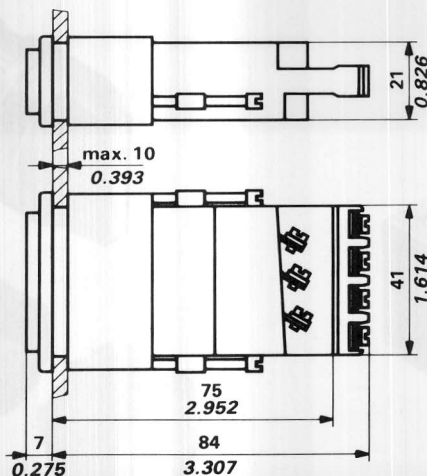


Series 02 Indicator

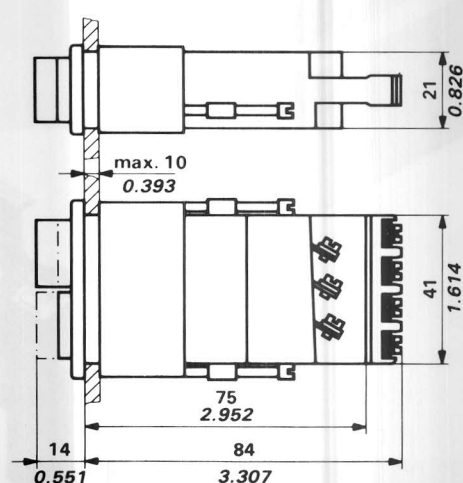
Series 02 Pushbutton Switch



Series 03 Indicator



Series 03 Pushbutton Switch, 1-button

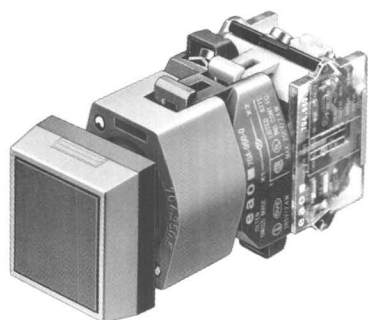


Series 03 Pushbutton Switch, 2-button

Oil & Watertight Switches and Indicators

Oil and watertight switches and indicators allow operation under severe environmental conditions. EAO oil & watertight assemblies meet IP 65 and NEMA 4 and 13 specifications. A wide variety of switching devices are available, ranging from heavy-duty power switches to 16 mm subminiature indicators, pushbuttons, and lever switches.

■ Series 04	
Heavy Duty Pushbuttons, Indicators, Levers, and Emergency	21
■ Series 14	
Snap Action and Low Level Pushbuttons, Indicators, and Levers	30
■ Series 22	
Front Panel Mounting Rectangular Pushbuttons and Indicators	34
■ Series 51/52	
Subminiature 16 mm Round Hole Mounting Pushbuttons and Indicators	35
■ Series 61	
Modular 16 mm Pushbuttons, Indicators, and Levers	38
■ Series 84	
Flush mount Pushbuttons and Indicators	45A



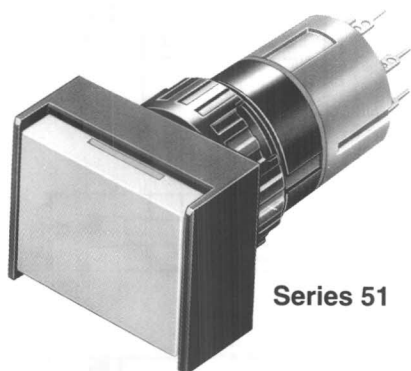
Series 04



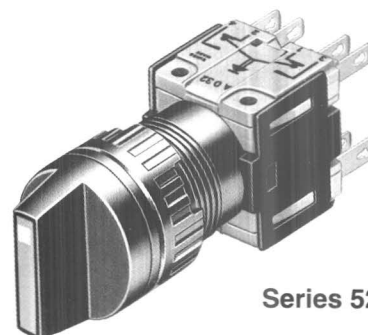
Series 14



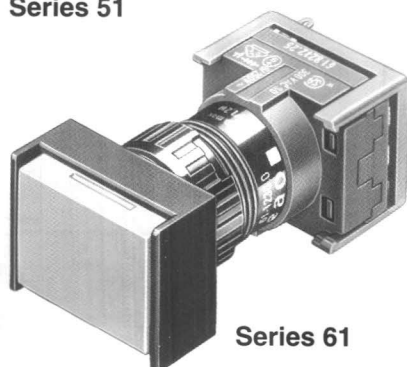
Series 22



Series 51



Series 52



Series 61



Series 84

Oil & Watertight Switches and Indicators

Series 04

Heavy Duty, High In-rush Current Indicators, Pushbutton Switches, Lever Switches, and Emergency Switches

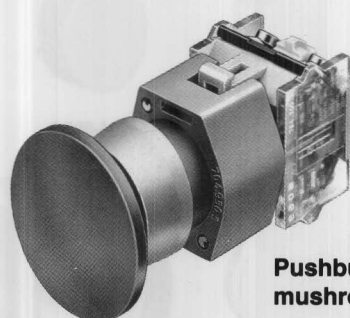
FEATURES

- 600 VAC/10 A, 220 VDC/0.5 A, 24 VDC/10 A
- Minimum depth: 2.01"
- Sealed switches meet IP 65 and NEMA 4 and 13 specifications
- Mount in 22.5 mm (7/8 inch) round hole
- Mount in panels to 0.315 inch thick
- Front panel replaceable lens and lamp
- Incandescent lamps/neons/multi-chip LEDs

Reference

International Approvals	page 3
Accessories	page 82
Lamps	page 94
Legends	page 100
Technical Specifications	page 104

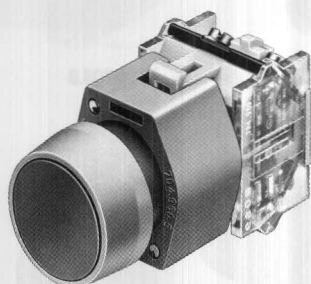
To order: See part ordering system with each pushbutton section, then order lamps and contact blocks separately. Select lever actuators by action, lever, and front ring type, then order contact block separately.



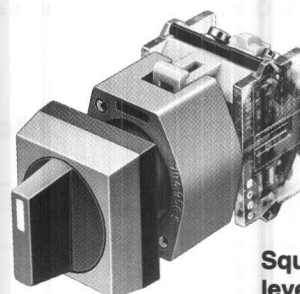
Pushbutton with mushroom lens



Indicator



Non-illuminated round pushbutton



Square short lever switch

Contact block

Screw-type or Q.C terminals

Lamp holder

Incandescent, neon, or LED lamp

Mounting flange

Rear tightening screws

Actuator sleeve

Momentary or maintained

Diffuser

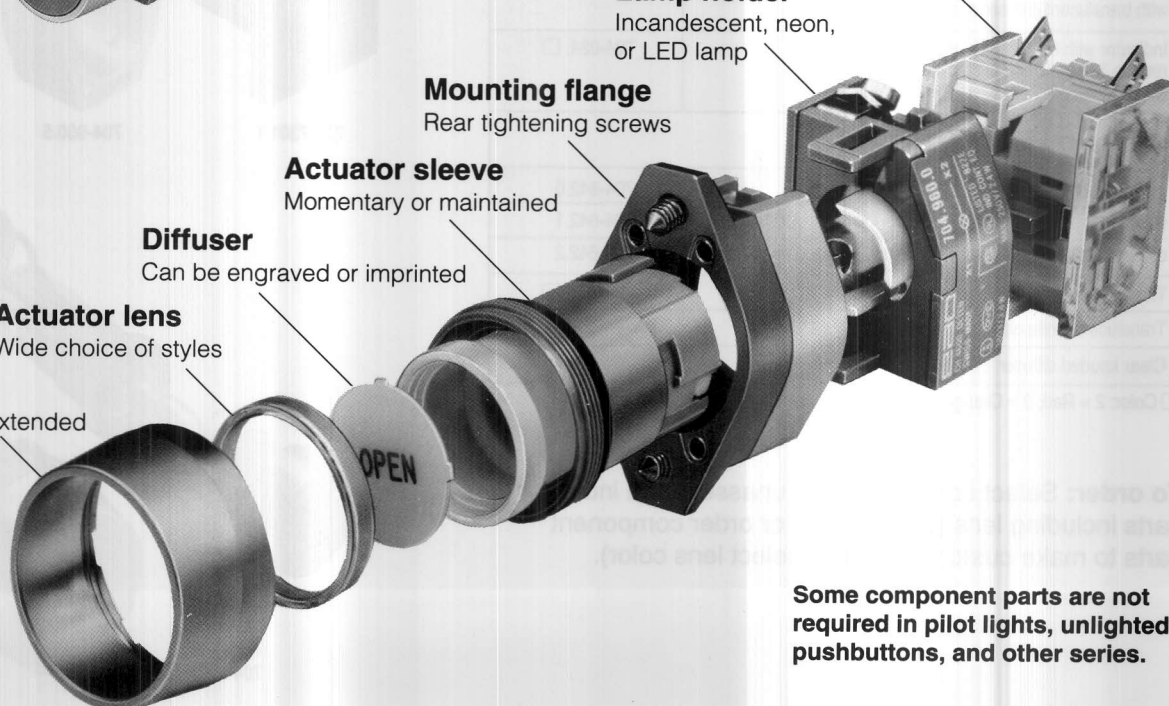
Can be engraved or imprinted

Actuator lens

Wide choice of styles

Front ring

Standard or extended



Some component parts are not required in pilot lights, unlighted pushbuttons, and other series.

Oil & Watertight Switches and Indicators

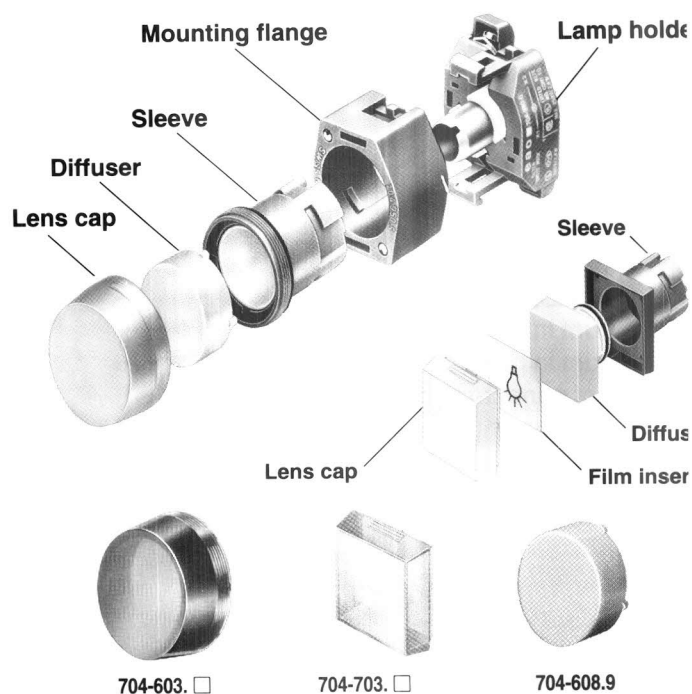
Series 04 Lighted Indicator Assemblies

Complete set of parts, unassembled. Order lamps separately.

☐ Add color digit

Bezel		Round	Square
With translucent diffuser, for incandescent lamp, includes mounting flange		704-000. <input type="checkbox"/>	704-200. <input type="checkbox"/>
With knurled transparent diffuser, for neon lamp, includes mounting flange		704-001. <input type="checkbox"/>	--
Component Parts			
Lens, transparent		704-603. <input type="checkbox"/>	704-703. <input type="checkbox"/>
Diffuser (can be engraved)	White	704-608.9	704-708.9
Diffuser, knurled	Clear	704-608.7	704-708.7
Film insert	Clear	--	704-706.7
Sleeve	Black Gray	-- 704-630.1	704-730.0 704-730.1
Mounting flange		704-950.5	704-950.5
Lamp holder	Screw 0.250" QC	704-950.0 704-950.1	704-950.0 704-950.1

☐ Color: 2 = Red, 3 = Orange, 4 = Yellow, 5 = Green, 6 = Blue, 7 = Clear



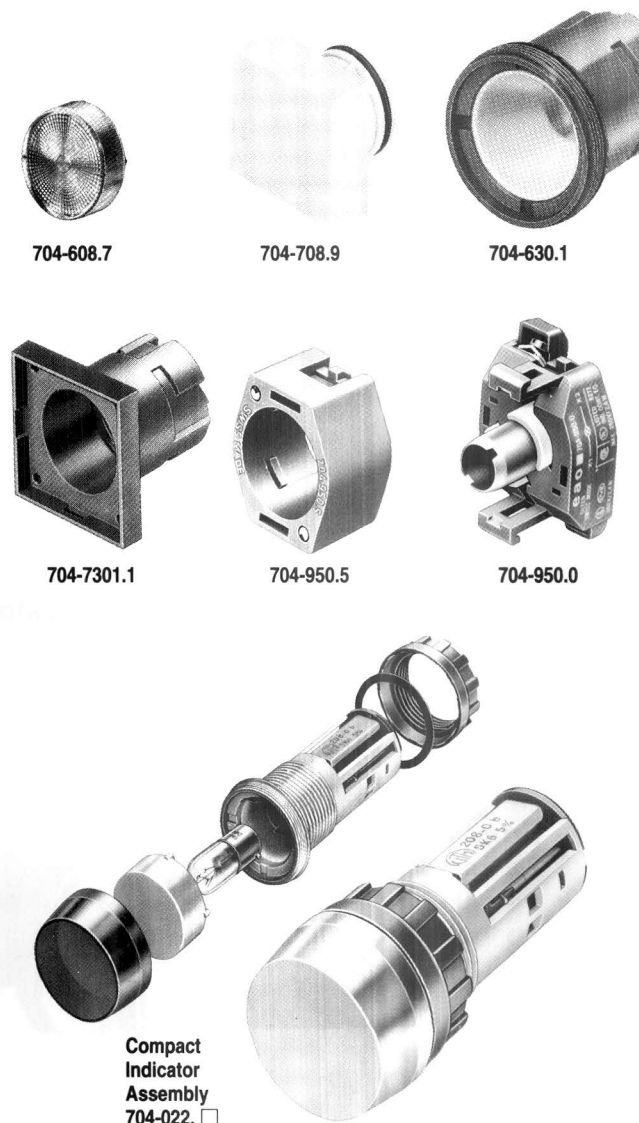
Series 04 Compact Lighted Indicator Assemblies

Built-in dropping resistor. Order lamp separately

☐ Add color digit

Description	Part Number
Indicator with white translucent diffuser and transparent lens for incandescent lamps 6 V - 130 V (2.6 W max.) or multi-chip LED 6 V - 48 V DC	704-020. <input type="checkbox"/>
Indicator with clear knurled diffuser and transparent lens for neon lamps	704-021. <input type="checkbox"/>
Indicator with built-in voltage dropping resistor to reduce 220 V AC to 130 V AC (2.6 W max.) with translucent diffuser and transparent lens	704-022. <input type="checkbox"/>
Indicator with built-in voltage dropping resistor to reduce 125 V AC to 60 V AC (2.6 W max) with translucent diffuser and transparent lens	704-024. <input type="checkbox"/>
Component Parts	
Indicator without resistor	704-642.0
without with 220 V to 130 V dropping resistor	704-642.1
diffuser and lens with 125 V to 60 V dropping resistor	704-642.2
Transparent lens	704-603. <input type="checkbox"/>
Translucent white diffuser	704-608.9
Clear knurled diffuser	704-608.7

















☐ Color: 2 = Red, 3 = Orange, 4 = Yellow, 5 = Green, 6 = Blue, 7 = Clear



To order: Select complete set of unassembled indicator parts including lens (select color) or order component parts to make custom indicator (select lens color).

Oil & Watertight Switches and Indicators

Series 04 Round Lighted Pushbuttons Order individual parts from table or use part ordering system for complete unassembled units.

Use These Parts		Front Ring			Lens & Caps (Choose one)			Diffuser		Lamp Holder Screw terminals 704-950.0 0.250" Q.C. 704-950.1	Actuator Sleeve Momentary 704-631.1 Maintained 704-632.1	Mounting Flange 704-950.5
		Standard	Extended	Sealed	Standard	Extended	Mushroom	Standard	Extended			
												
For This Effect												
	Lens flush with front ring (Guard)	✓			✓			✓				
	Lens with extended front ring (Guard)		✓		✓			✓				
	Extended lens	✓				✓			✓			
	Lens with sealed front ring (Guard) for extra protection			✓	✓			✓				
	Mushroom Cap	✓					✓	✓				
Description	Color									Order lamps and contact blocks separately		
Plastic opaque	Black	704-600.0										
Plastic transparent	Red				704-602.2	704-611.2	704-614.2					
Plastic transparent	Orange				704-602.3							
Plastic transparent	Yellow				704-602.4	704-611.4	704-614.4					
Plastic transparent	Green				704-602.5	704-611.5	704-614.5					
Plastic transparent	Blue				704-602.6	704-611.6	704-614.6					
Plastic transparent	Clear				704-602.7	704-611.7	704-614.7	704-609.7	704-610.7			
Plastic opaque	Gray	704-600.6	704-600.7									
Plastic translucent	White							704-609.9	704-610.9			
Chrome plated plastic	Chrome	704-600.4										
Anodized aluminum	Aluminum	704-600.1										
Nickel chromium steel	Steel	704-600.9										
Silicone cover	Anod. Al ring			704-600.3								
Silicone cover	Ni plated brass			704-600.2								

Part Ordering System

704 - 01 -

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Pushbutton Action	Lens Style	Termination Style
1 - Momentary	Standard	Screw
2 - Momentary	Standard	0.250" Q.C.
3 - Momentary	Extended	Screw
4 - Momentary	Extended	0.250" Q.C.
5 - Maintained	Standard	Screw
6 - Maintained	Standard	0.250" Q.C.
7 - Maintained	Extended	Screw
8 - Maintained	Extended	0.250" Q.C.
9 - Momentary	Mushroom	Screw
10 - Momentary	Mushroom	0.250" Q.C.
11 - Maintained	Mushroom	Screw
12 - Maintained	Mushroom	0.250" Q.C.

Front Ring Material	
0 - Standard	Black plastic
1 - Standard	Anodized Al
2 - Sealed	Ni plated brass
	Silicone cover
3 - Sealed	Anodized Al
	Silicone cover
4 - Standard	Chrome plastic
6 - Standard	Gray plastic
7 - Extended	Gray plastic
9 - Standard	Steel

Diffuser*
Type












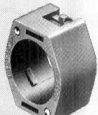




7 - Clear
9 - White

* White translucent for incandescent lamps and clear knurled for neon.

Lens Color
2 - Transparent red
3 - Transparent orange (STD)
4 - Transparent yellow
5 - Transparent green
6 - Transparent blue
7 - White (uses clear lens/white diffuser)

Oil & Watertight Switches and Indicators

Series 04 Round Unlighted Pushbuttons Order individual parts from table or use part ordering system for complete unassembled units.

Use These Parts		Front Ring			Lens & Caps (Choose one)				Diffuser (If needed)		Actuator Sleeve Momentary 704-631.1 Maintained 704-632.1	Mounting Flange 704-950.5
		Standard	Extended	Sealed	Standard	Extended	Metal	Mushroom	Standard	Extended		
												
For This Effect												
	Lens flush with front ring (Guard)	✓			✓		✓		✓			
	Lens with extended front ring (Guard)		✓		✓		✓		✓			
	Extended lens	✓				✓				✓		
	Lens with sealed front ring (Guard) for extra protection			✓	✓		✓		✓			
	Mushroom Cap	✓						✓				
Description	Color										Order lamps and contact blocks separately	
Front rings, lenses and mushroom caps in plastic or Metal lenses in anodized aluminum	Black	704-600.0			704-602.0	704-611.0	704-601.0	704-604.0	704-609.0	704-610.0		
	Red				704-602.2	704-611.2	704-601.2	704-604.2				
	Orange				704-602.3							
	Yellow				704-602.4	704-611.4	704-601.4	704-604.4				
	Green				704-602.5	704-611.5	704-601.5	704-604.5				
	Blue				704-602.6	704-611.6	704-601.6					
	Clear				704-602.7	704-611.7			704-609.7	704-610.7		
	Gray	704-600.6	704-600.7				704-601.8					
Plastic translucent	White								704-609.9	704-610.9		
Chrome plated plastic	Chrome	704-600.4										
Anodized aluminum	Aluminum	704-600.1										
Nickel chromium steel	Steel	704-600.9					704-601.9					
Silicone cover	Anod. Al ring			704-600.3								
Silicone cover	Ni plated brass			704-600.2								

Part Ordering System

704 - 02 - () () () ()

Pushbutton Action	Lens/Cap Style
1 - Momentary	Standard—plastic
2 - Momentary	Standard—metal
3 - Momentary	Extended—plastic
4 - Momentary	Mushroom—plastic
5 - Maintained	Standard—plastic
6 - Maintained	Standard—metal
7 - Maintained	Extended—plastic
8 - Maintained	Mushroom—plastic

Style	Material
0 - Standard	Black plastic
1 - Standard	Anodized Al
2 - Sealed	Ni plated brass
	Silicone cover
3 - Sealed	Anodized Al
	Silicone cover
4 - Standard	Chrome plastic
6 - Standard	Gray plastic
7 - Extended	Gray plastic
9 - Standard	Steel

Diffuser Type
0 - Black
1 - No diffuser (Mushroom or opaque lens)
7 - Clear
9 - White

Lens/Cap Color
0 - Black
2 - Red
3 - Orange*
4 - Yellow
5 - Green
6 - Blue**
7 - White***
8 - Aluminum**
9 - Steel**

* Use with standard plastic lens only.

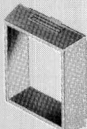







** Not available with mushroom cap.

*** Combination of clear lens and white diffuser

Oil & Watertight Switches and Indicators

Series 04 Square Pushbuttons with Transparent Lens — Lighted or Unlighted

Order individual parts from table or use part ordering system for complete unassembled units.

		Bezel	Lens	Film Insert	Lens Holder	Actuator Sleeve	Mounting Flange	Lamp Holder
Use These Parts								
For This Effect								
	Lighted	✓	✓	optional	✓	✓	✓	✓
	Unlighted	✓	✓	optional	✓	✓	✓	
Description	Color					Order lamps and contact blocks separately		
Opaque plastic	Black	704-701.0	704-702.0					
	Light gray	704-701.6						
	Chrome	704-701.4						
Transparent plastic	Red		704-702.2					
	Orange		704-702.3					
	Yellow		704-702.4					
	Green		704-702.5					
	Blue		704-702.6					
	Clear		704-702.7	704-707.7	704-709.7			
Translucent plastic	White				704-709.9			

Part Ordering System

704 - 03 - ()

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Pushbutton Action	Lighted or Unlighted	Film Insert
0 - Momentary	Lighted	With
1 - Momentary	Lighted	Without
2 - Momentary	Unlighted	With
3 - Momentary	Unlighted	Without
4 - Maintained	Lighted	With
5 - Maintained	Lighted	Without
6 - Maintained	Unlighted	With
7 - Maintained	Unlighted	Without

Lamp Holder
0 - No lamp holder
1 - Lamp holder screw terminals
2 - Lamp holder 0.250" Q.C. terminals

Bezel Color
0 - Black
4 - Chrome
6 - Light gray

Lens Color
0 - Black
2 - Red
3 - Orange
4 - Yellow
5 - Green
6 - Blue
7 - White*

* Combination of clear lens and white diffuser

Oil & Watertight Switches and Indicators

Series 04 Long and Short Lever Actuators — Round and Square

Includes mounting flange, but contact blocks must be ordered separately

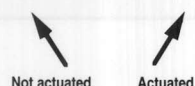
Description	Lever Actuator Position Action*	Bezel	Long Lever		Short Lever	
			Gray plastic front ring	Anodized Al front ring	Gray plastic front ring	Anodized Al front ring
2 positions 45°	momentary	round square	704-102.0 704-302.0	704-103.0 --	704-412.0 704-512.0	704-413.0 --
2 positions 90°	maintained	round square	704-100.0 704-300.0	704-101.0 --	704-410.0 704-510.0	704-411.0 --
3 positions 45°	maintained	round square	704-092.0 704-292.0	704-093.0 --	704-402.0 704-502.0	704-403.0 --
3 positions 45°	momentary	round square	704-094.0 704-294.0	704-095.0 --	704-404.0 704-504.0	704-405.0 --
3 positions 45°	maintained	round square	704-096.0 704-296.0	704-097.0 --	704-406.0 704-506.0	704-407.0 --
3 positions 45°	momentary	round square	704-098.0 704-298.0	704-099.0 --	704-408.0 704-508.0	704-409.0 --

* Symbol indicates a maintained position with no operation of the contact block.

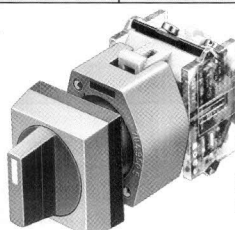
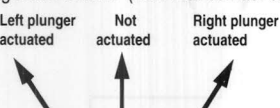
Lever Switch Closures

With lever actuators, it is possible to obtain a variety of switch closures. Each contact block can be obtained with 1 or 2 independent switching elements. By proper selection of N.O., N.C., and combinations of both, various patterns can be generated.

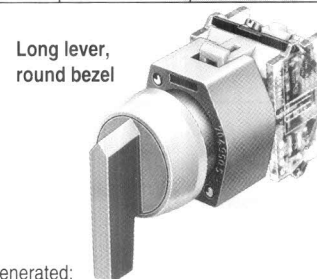
Two position rotary long or short lever actuators have a double cam that actuates the contact block plungers as follows:



Three position long or short lever actuators have a single cam that actuates the contact block plungers as follows (note that contact blocks can be reversed 180°):



Short lever,
square bezel



Long lever,
round bezel

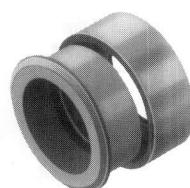
The following switch patterns can therefore be generated:

Contact Block	Plunger Green - N.O. Red - N.C.	Switch Contacts	
		Not Actuated	Actuated
N.O.	green	open	closed
N.C.	red	closed	open
N.O. N.O.	green green	open open	closed closed
N.C. N.C.	red red	closed closed	open open
N.O. N.C.	green red	open closed	closed open

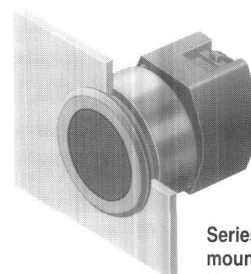
Flush mount adapter

Designed for use with Series 04 pushbuttons, indicators, and short or long lever switches, the 2-piece flush mount adapter mounts in a standard 30.5 mm hole and maintains the front panel NEMA 4 & 13 and IP 65 sealing. The low cost adapters have a brushed aluminum finish and are easy to mount and disassemble.

Description	Part Number
Flush mount adapter for Series 04	704-955.1



Flush mount adapter



Series 04 pushbutton
mounted using flush
mount adapter

Oil & Watertight Switches and Indicators

Series 04 Emergency Pushbutton Actuators

Order contact blocks separately. To assure proper contact separation under all conditions, slow make/slow break contacts are recommended for emergency pushbutton actuators.

Maintained action, rotary release

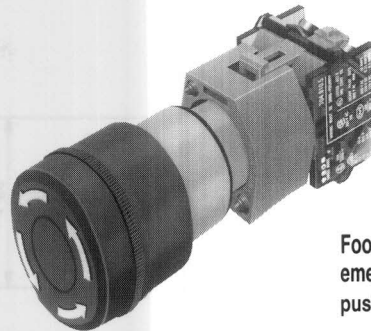
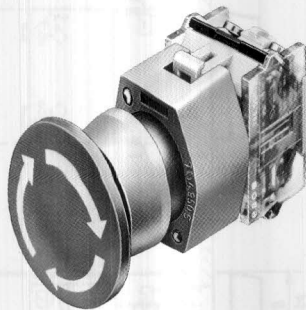
To release, twist cap in the direction of arrows



Arrows legend



STOP legend



Foolproof emergency stop pushbutton

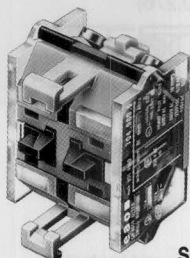
NEW "FOOLPROOF" Emergency Pushbutton Actuator Meets current VDE safety specifications

New safety specifications for emergency stop switches have been developed by VDE. The new design prevents "teasing" of the pushbutton which can result in premature contact operation and eliminates the possibility of blocking the pushbutton operation by lodging foreign bodies behind the actuator.

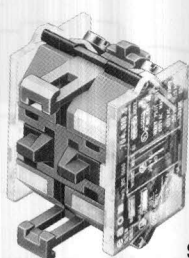
Description	Part Number
Foolproof emergency pushbutton actuator Yellow actuator, red plastic mushroom cap with white arrows	704-064.2

Series 04 Contact Blocks ☐ Add digit for contacts

Up to four contact blocks may be connected to any one actuator



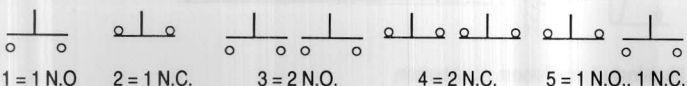
Snap action



Slow make/
slow break

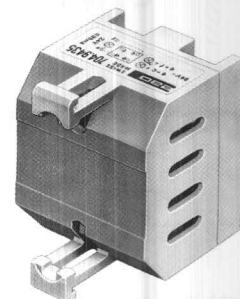
Description	Part Number
Snap Action	
Hard silver contacts	704-900. <input type="checkbox"/>
Hard silver contacts, 0.250" Q.C. terminals	704-905. <input type="checkbox"/>
Gold/silver contacts	704-901. <input type="checkbox"/>
Silver/palladium contacts	704-902. <input type="checkbox"/>
Slow Make/Slow Break Action	
Hard silver contacts	704-910. <input type="checkbox"/>
Hard silver contacts, 0.250" Q.C. terminals	704-915. <input type="checkbox"/>
Gold/silver contacts	704-911. <input type="checkbox"/>
Silver/palladium contacts	704-912. <input type="checkbox"/>

☐ Contacts :



Series 04 Flashers

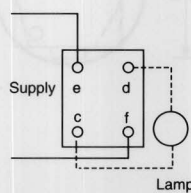
1.5 Hz flash frequency, 1:1 pulse ratio, 0-50°C ambient
CISPR-CH interference suppression.



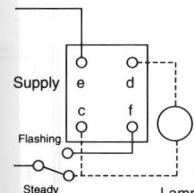
32 mm H x 29 mm W x 28.5 mm L
(1.26 x 1.14 x 1.12 in.)

Description	Part Number
For 220 V AC, 50-60 Hz $\pm 10\%$, use 130 V, 20 mA (max.) lamp	704-943.0
For 110 V AC, 50-60 Hz $\pm 10\%$, use 60 V, 20 mA (max.) lamp	704-943.1
For 24 V DC $\pm 15\%$, use 24 V, 10-85 mA lamp	704-943.5

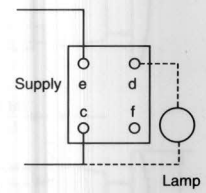
Recommended circuits



For flashing lamp



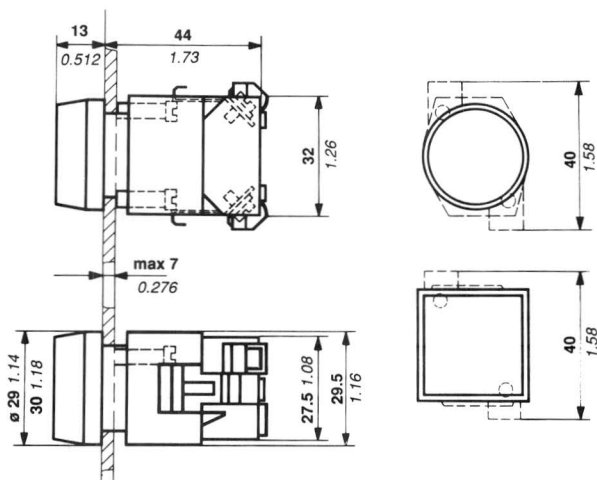
For flashing or
continuous lighting



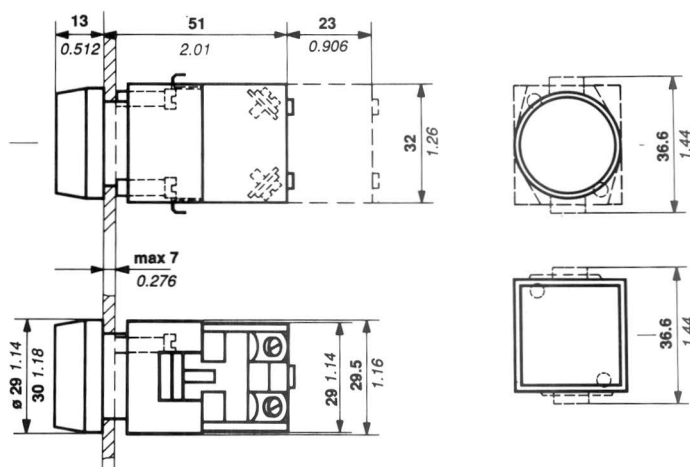
For continuous
lighting

Oil & Watertight Switches and Indicators

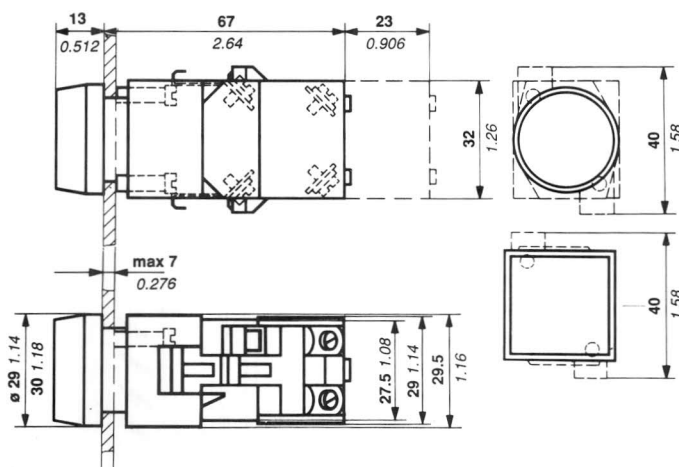
Series 04 Dimensions & Mounting Information



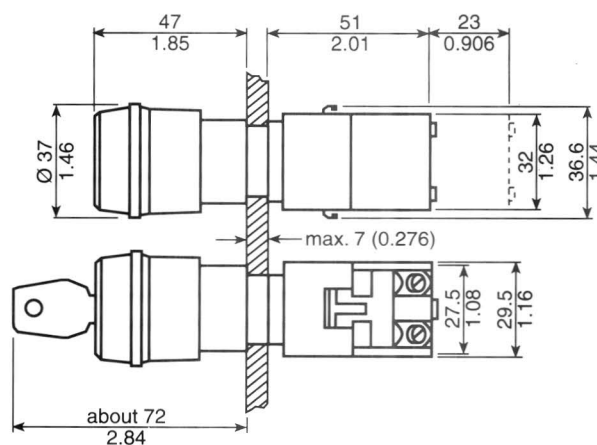
Indicator, round and square



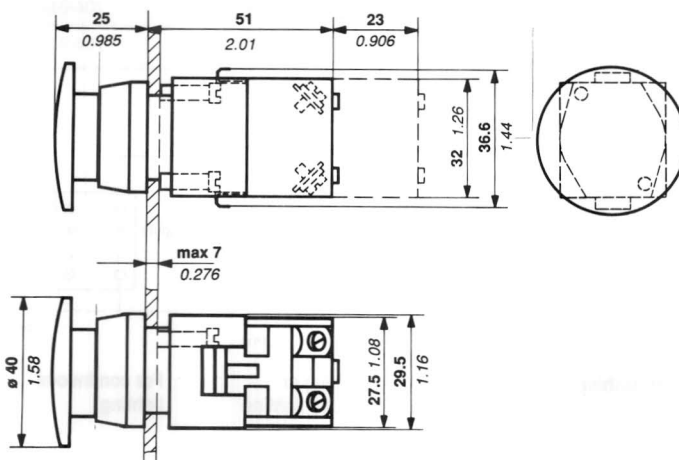
Pushbutton, round and square



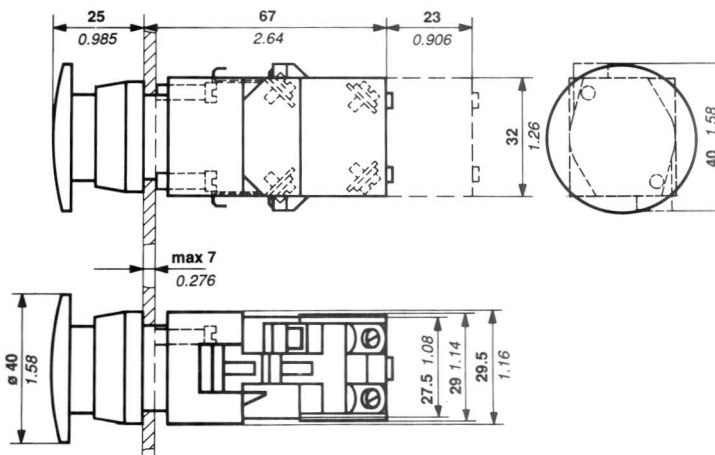
Lighted pushbutton, round and square



"Foolproof" Emergency stop switches (pushbutton and keylock)



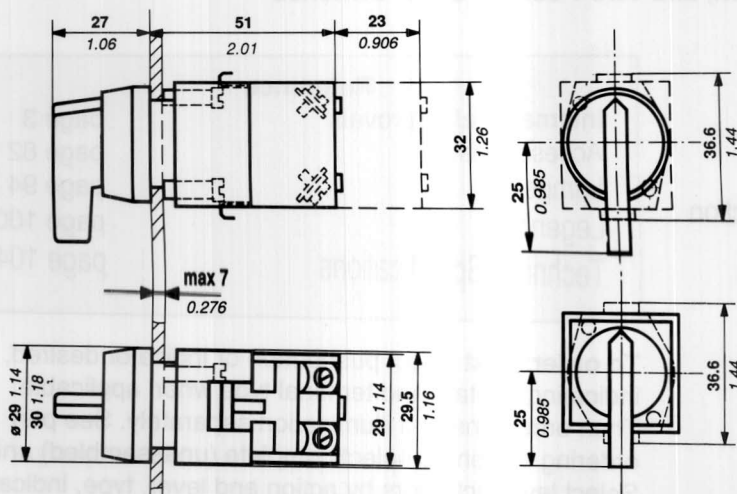
Mushroom and emergency pushbutton



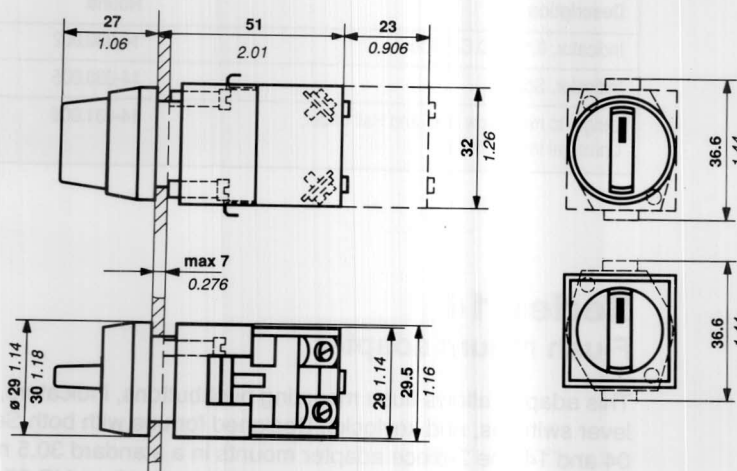
Illuminated mushroom pushbutton

Oil & Watertight Switches and Indicators

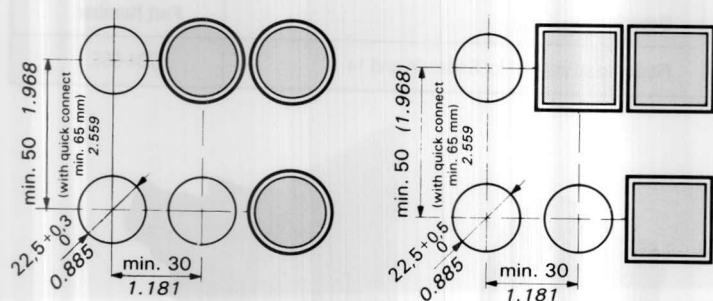
Series 04 Dimensions & Mounting Information



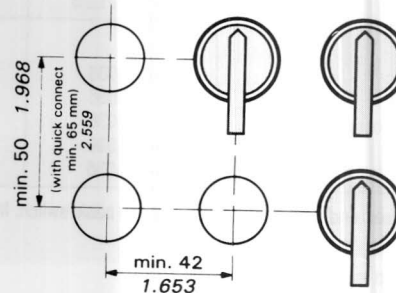
Long lever actuator, round and square



Short lever actuator, round and square



Mounting dimensions for indicators, pushbuttons, and short lever switches



Mounting dimensions for mushroom and long lever switches

Oil & Watertight Switches and Indicators

Series 14

Oil & Watertight Indicators, Illuminated Pushbutton, and Two-Position Lever Switches

FEATURES

- Sealed switches meet IP65 and NEMA 4 and 13 specifications
- Mount in 22.5 mm round hole (7/8 inch)
- 250 VAC/5 A, 220 VDC/0.1 A, 24 VDC/2 A snap action
42 VAC/0.1 A, 42 VDC/0.1 A low level
- Minimum depth: 1.18"
- Front panel replaceable lens and lamp
- Incandescent lamps/neons/multi-chip LEDs



Series 14
Pushbutton Switch
Snap Action



Series 14
Pushbutton Switch
Low Level

Series 14 Lighted Pushbuttons

(Order lens and lamp separately)

Switch Elements	Momentary Round	Maintained Round
Snap Action		
1-pole Form Z	14-131.0 □ □	14-271.0 □ □
2-pole Form Z	14-132.0 □ 5	14-272.0 □ 5
3-pole Form Z	14-133.0 □ 5	14-273.0 □ 5
4-pole Form Z	14-134.0 □ 5	14-274.0 □ 5
Low Level		
2 N.O. contacts	14-431.036	14-471.036
2 N.C. contacts	14-432.036	14-472.036
1 N.O., 1 N.C. contact	14-433.036	14-473.036
1 N.O. contact	14-435.036	14-475.036
1 N.C. contact	14-436.036	14-476.036

Note: Lens, diffuser, and front ring not supplied with basic switch. Must be ordered separately.

Select contact and terminal type where applicable

.0 □ □

1st digit is always 0 (Case color is black)

Contact material (second digit): 1 = Silver, 2 = Gold over silver

Terminal type (third digit): 2 = 0.110" Q.C., 5 = Solder

Reference

International Approvals	page 3
Accessories	page 82
Lamps	page 94
Legends	page 100
Technical Specifications	page 104

To order: First select pushbutton or indicator desired, indicating contact and terminal type when applicable. Then order lens and illumination separately. See part ordering system to select complete (unassembled) units. Select lever actuators by action and lever, type, indicating contact and terminal type when applicable.

Series 14 Lighted Indicators

(Order lens and lamp separately)

Description	Round
Indicator, 0.110" Q.C./Solder	14-030.002
Indicator, Solder	14-030.005
Length to match low level and Hall Effect, Universal terminations	14-031.006

Series 14

Flush mount adapter

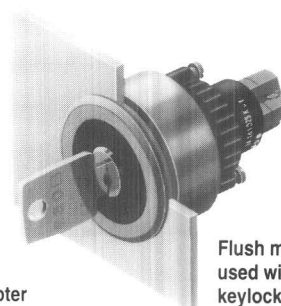
This adapter allows flush mounting pushbuttons, indicators, lever switches, and keylocks. Designed for use with both Series 04 and 14, the 2-piece adapter mounts in a standard 30.5 mm hole and maintains the front panel NEMA 4 & 13 and IP 65 sealing. Series 14 pushbuttons, short lever switches, and keylocks are suitable for use with the flush mount adapter.

The low cost adapters have a brushed aluminum finish and are easy to mount and disassemble.

Description	Part Number
Flush mount adapter for Series 04 and 14	704-955.1



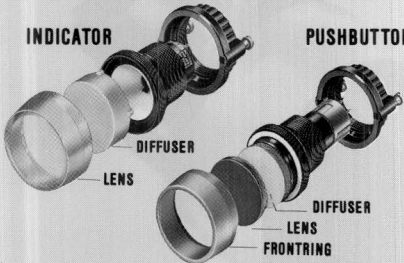








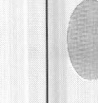


Flush mount adapter




Flush mount adapter
used with Series 14
keylock

Oil & Watertight Switches and Indicators

Series 14 Lenses/Mushroom Caps/Diffusers/Front Ring Components

<div><div>INDICATOR</div><div></div></div>		Indicator		Pushbutton								
		Lens	Diffuser	Front Ring		Lenses & Caps					Diffuser	
		Standard	Standard	Standard**	Sealed	Standard	Extended	Metal	Mushroom opaque	Mushroom transparent	Standard	Extended
												
Front Rings, Lenses, and Mushroom Caps in Plastic or Metal Lenses in Anodized Aluminum	Black*			704-600.0		704-602.0	704-611.0	704-601.0	704-604.0		704-609.0	704-610.0
	Red	704-603.2				704-602.2	704-611.2	704-601.2	704-604.2	704-614.2		
	Orange	704-603.3				704-602.3						
	Yellow	704-603.4				704-602.4	704-611.4	704-601.4	704-604.4	704-614.4		
	Green	704-603.5				704-602.5	704-611.5	704-601.5	704-604.5	704-614.5		
	Blue	704-603.6				704-602.6	704-611.6	704-601.6		704-614.6		
	Clear	704-603.7	704-608.7			704-602.7	704-611.7			704-614.7	704-609.7	704-610.7
	Gray*			704-600.6								
Plastic Translucent	White		704-608.9								704-609.9	704-610.9
Chrome Plated Plastic	Chrome			704-600.4								
Anodized Aluminum	Aluminum			704-600.1				704-601.8				
Nickel Chormium Steel	Steel			704-600.9				704-601.9				
Silicone Cover	Al Anodized Ring				704-600.3							
Silicone Cover	Ni Plated Brass				704-600.2							

* Opaque plastic lenses

**  For extended front ring: part no. 704-600.7 (Gray plastic)

Part Ordering System

Pushbutton or Indicator Part Number

14 - () () () - () () () - () () () () ()

Lens/Cap Style	Front Ring		Diffuser Type	Lens/Cap Color	Lamp Style and Voltage
Pushbutton	Style	Material			
1. Standard, Plastic	0 - Standard	Black plastic	0 - Black	0 - Black	A - No lamp
2. Standard, Metal	1 - Standard	Anodized alum.	1 - No diffuser	2 - Red	I - Incandescent
3. Extended, Plastic	2 - Indicator	Front ring not required	(Mushroom or opaque lens)	3 - Orange (Standard lens only)	I.0 6 V
4. Mushroom, Plastic, opaque*	3 - Sealed	Anodized aluminum		4 - Yellow	I.1 12 V
5. Mushroom, Plastic, transparent*	4 - Standard	Silicone cover	7 - Clear	5 - Green	I.2 24 V
	5 - Sealed	Chrome plastic	9 - White	6 - Blue*	I.3 30 V
or Indicator		Ni plated brass		7 - White**	I.4 36 V
1. Standard, Plastic	6 - Standard	Silicone cover		8 - Aluminum (Metal lens only)	I.5 48 V
	7 - Extended	Gray plastic		9 - Steel (Metal lens only)	I.6 60 V
	9 - Standard	Steel			N - Neon
					N.0 110 V
					N.1 220 V

* Use extended front ring

* Not available in opaque mushroom cap

** Use clear lens and white diffuser

L - LED

L ☐ ☐

1st digit Voltage	2nd digit Color
0 = 6 V	2 = Red
1 = 12 V	4 = Yellow
2 = 24 V	5 = Green
4 = 48 V	

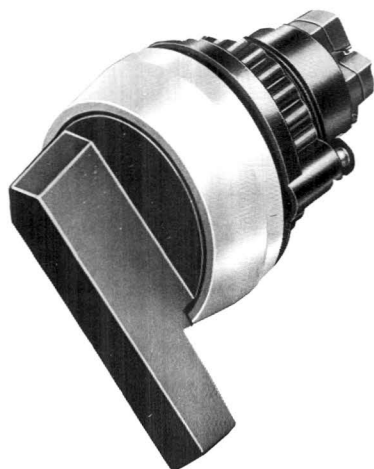
Example: 14-131.022 switch with standard green plastic lens, chrome plated front ring, white diffuser, 24 Volt incandescent lamp. Complete assembly part number is:

14-131.022.1495I.2

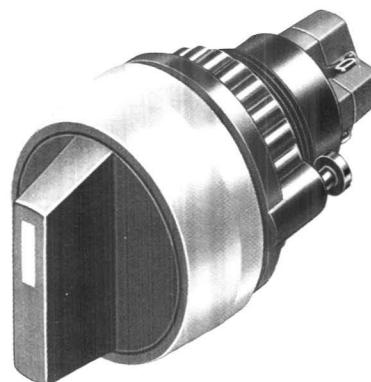
Oil & Watertight Switches and Indicators

Series 14 Two Position Lever Switches

Long lever switch
with anodized aluminum
front ring



Short lever switch
with anodized aluminum
front ring



Long Lever

Switch Element	45° Angle Momentary	90° Angle Maintained
Snap Action		
1-pole Form Z	14-551.0 □ □ 0	14-556.0 □ □ 0
2-pole Form Z	14-552.0 □ 50	14-557.0 □ 50
3-pole Form Z	14-553.0 □ 50	14-558.0 □ 50
4-pole Form Z	14-554.0 □ 50	14-559.0 □ 50
Low Level		
2 N.O. contacts	14-565.0360	14-570.0360
2 N.C. contacts	14-566.0360	14-571.0360
1 N.O., 1 N.C.	14-567.0360	14-572.0360

Short Lever

Switch Element	45° Angle Momentary	90° Angle Maintained
Snap Action		
1-pole Form Z	14-501.0 □ □ 0	14-506.0 □ □ 0
2-pole Form Z	14-502.0 □ 50	14-507.0 □ 50
3-pole Form Z	14-503.0 □ 50	14-508.0 □ 50
4-pole Form Z	14-504.0 □ 50	14-509.0 □ 50
Low Level		
2 N.O. contacts	14-515.0360	14-520.0360
2 N.C. contacts	14-516.0360	14-521.0360
1 N.O., 1 N.C.	14-517.0360	14-522.0360

Select contact and terminal type where applicable.

.0 □ □ 0

1st digit is always 0 (Case color is black)

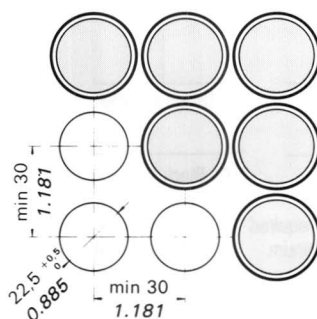
Contact material (2nd digit): 1 = Silver, 2 = Gold over silver

Terminal type (3rd digit): 2 = 0.110" Q.C., 5 = Solder

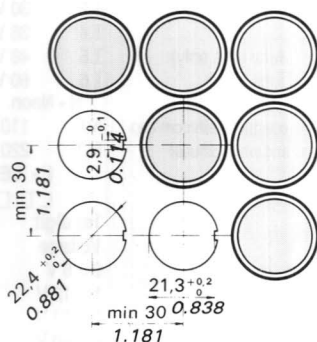
4th digit is always 0 (Lever color is black)

Dimensions & Mounting Information

Not secured against rotation
Indicators and pushbuttons

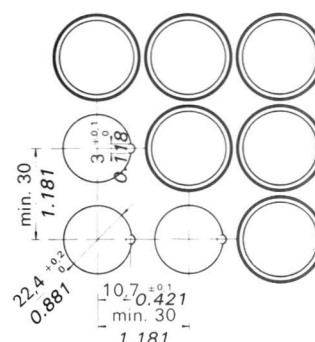


or
By using the accessory
anti-rotation insert (14-910)



To prevent rotation of lever switch

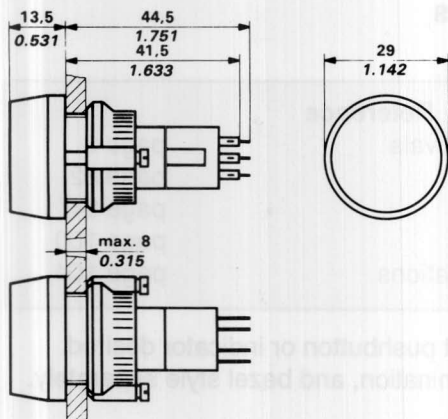
Note: Long lever
switches need
min. 42 mm
(1.65") horizontal
center-to-center
and min. 50 mm
(1.97") vertical
center-to-center.



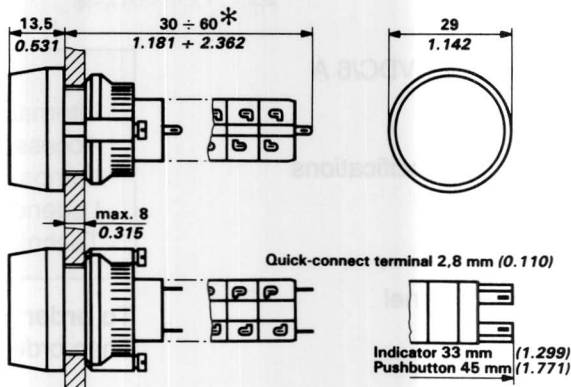
With anti-rotation insert (14-910)

Oil & Watertight Switches and Indicators

Series 14 Dimensions & Mounting Information

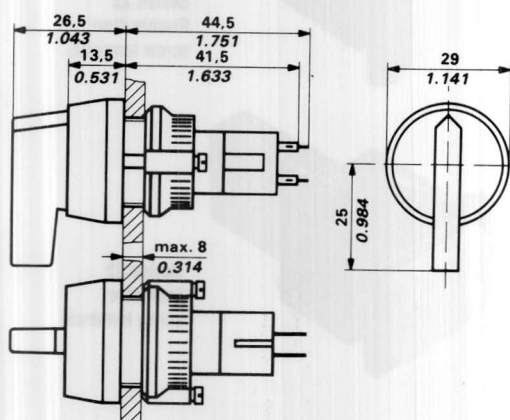


Indicator or pushbutton with low level switch element

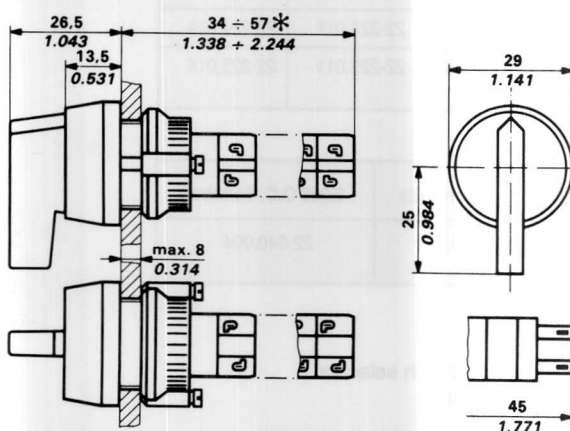


Indicator or pushbutton with snap action switch element

- * Indicator, 30 (1.18)
 1 pole, 37.5 (1.48)
 2 pole, 45 (1.77)
 3 pole, 52.5 (2.07)
 4 pole, 60 (2.36)

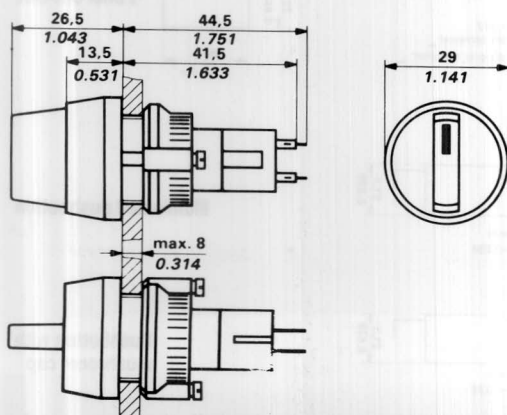


Long lever switch with low level switch element

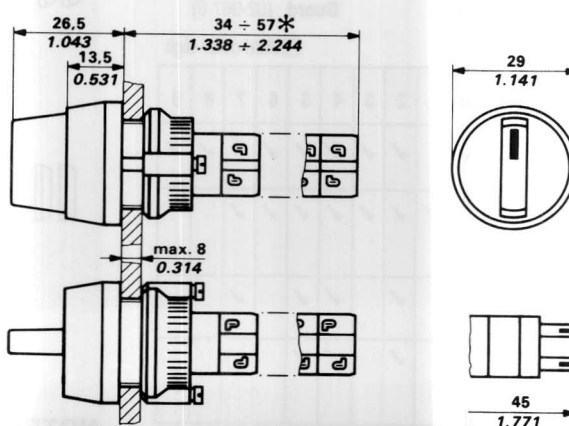


Long lever switch with snap action switch element

- * 1 pole, 34.5 (1.36)
 2 pole, 42 (1.65)
 3 pole, 49.5 (1.95)
 4 pole, 57 (2.24)



Short lever switch with low level switch element



Short lever switch with snap action switch element

- * 1 pole, 34.5 (1.36)
 2 pole, 42 (1.65)
 3 pole, 49.5 (1.95)
 4 pole, 57 (2.24)

Oil & Watertight Switches and Indicators

Series 22

Illuminated Oil & Watertight Pushbutton Switches and Indicators

FEATURES

- 380 VAC/10 A, 220 VDC/0.2 A, 24 VDC/6 A
- Minimum depth: 2.34"
- Sealed switches
- Meet IP65 and NEMA 4 and 13 specifications
- Double air break 3 mm contact gap
- Screw or quick connect terminals
- Lighted mushroom cap
- Mounts completely from front of panel

Lighted Pushbuttons

(Order lens, lamp, and bezel style separately)

Switch Element Description	Momentary		Maintained	
	Screw Terminals	0.250" Q.C. Terminals	Screw Terminals	0.250" Q.C. Terminals
1PST, N.O. DB*	22-211.011	22-211.014	22-221.011	22-221.014
1PST, N.C. DB	22-212.011	22-212.014	22-222.011	22-222.014
2PST, N.O. DB	22-213.011	22-213.014	22-223.011	22-223.014
2PST, N.C. DB	22-214.011	22-214.014	22-224.011	22-224.014
1PST, N.O. DB	22-215.011	22-215.014	22-225.011	22-225.014
1PST, N.C. DB				

Lighted Indicators

Description	Screw Terminals	0.250 Q.C. Terminals
Indicator length to match pushbutton & keylock switches	22-040.001	22-040.004

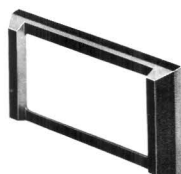
* DB = Double air break

Bezel Style

Bezel style must be chosen to complete switch selection.
Bezels snap over front end before installation



Flat
(02-965.0)



2-Sided Raised Protection
Guard (02-966.0)



4-Sided Raised Protection
Guard (02-967.0)

Lenses

☐ Add color digit

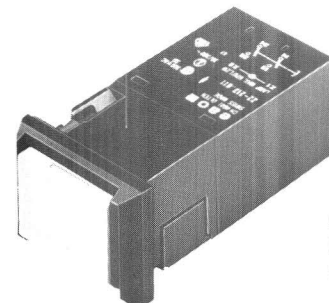
Description	Part No.	0	1	2	3	4	5	6	7	8	9
Translucent lens, flat with translucent diffuser	22-901. <input type="checkbox"/>	✓		✓	✓	✓	✓	✓		✓	✓
Transparent lens, flat with translucent diffuser (for film applications)	22-903. <input type="checkbox"/>		✓	✓	✓	✓	✓	✓	✓		
Transparent lens, flat with transparent diffuser	22-905. <input type="checkbox"/>			✓		✓	✓		✓		
Translucent Mushroom Cap with translucent diffuser (Use only flat (A.) front bezel)	22-930. <input type="checkbox"/>	✓		✓		✓	✓				

0 = Black, 1 = Solar Black, 2 = Red, 3 = Orange, 4 = Yellow, 5 = Green, 6 = Blue
7 = Clear, 8 = Gray, 9 = White. Black and Gray are opaque.

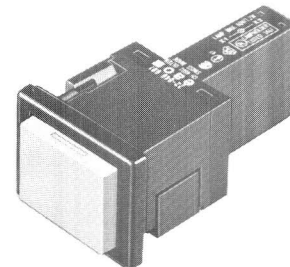
Reference

International Approvals	page 3
Accessories	page 82
Lamps	page 94
Legends	page 100
Technical Specifications	page 104

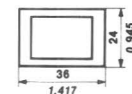
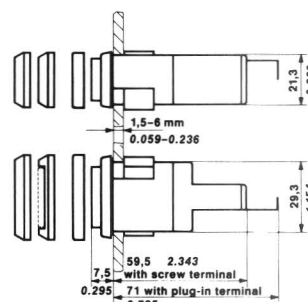
To order: First select pushbutton or indicator desired.
Then order lens, illumination, and bezel style separately.



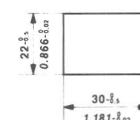
Series 22
Pushbutton
screw terminals



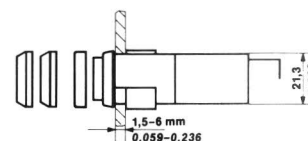
Series 22
Indicator
screw terminals



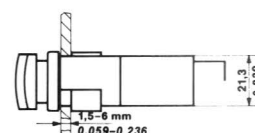
Indicator



Panel Cut-Out



Illuminated pushbutton



Pushbutton with
mushroom cap

NOTE: See Series 22 Keylocks for installation, removal, and mounting matrix layout.

Oil & Watertight Switches and Indicators

Series 51/52

Subminiature Lighted Oil & Watertight Indicators and Pushbuttons (Series 51) and 2- and 3-Position Rotary Switches (Series 52) with 16 mm Round Hole Mounting

FEATURES

- 250 VAC/5A, 220 VDC/0.1 A, 24 VDC/2 A snap action
42 VAC/0.1 A, 42 VDC/0.1 A low level
- Minimum depth: 1.14"
- Sealed switches
- Meet IP65 and NEMA 4 and 13 specifications
- Mount in panels to 0.255 inch thick

Series 51 Lighted Pushbuttons

(Order lamp and lens separately)

Momentary

Switch Element	Rectangular	Square	Round
Snap Action			
1-pole Form Z	51-121.0 □ □	51-151.0 □ □	51-131.0 □ □
2-pole Form Z	51-122.0 □ 5	51-152.0 □ 5	51-132.0 □ 5
3-pole Form Z	51-123.0 □ 5	51-153.0 □ 5	51-133.0 □ 5
4-pole Form Z	51-124.0 □ 5	51-154.0 □ 5	51-134.0 □ 5
Low Level			
2 N.O. contacts	51-421.036	51-451.036	51-431.036
2 N.C. contacts	51-422.036	51-452.036	51-432.036
1 N.O., 1 N.C.	51-423.036	51-453.036	51-433.036
1 N.O. contact	51-425.036	51-455.036	51-435.036
1 N.C. contact	51-426.036	51-456.036	51-436.036

Maintained

Switch Element	Rectangular	Square	Round
Snap Action			
1-pole Form Z	51-261.0 □ □	51-281.0 □ □	51-271.0 □ □
2-pole Form Z	51-262.0 □ 5	51-282.0 □ 5	51-272.0 □ 5
3-pole Form Z	51-263.0 □ 5	51-283.0 □ 5	51-273.0 □ 5
4-pole Form Z	51-264.0 □ 5	51-284.0 □ 5	51-274.0 □ 5
Low Level			
2 N.O. contacts	51-461.036	51-481.036	51-471.036
2 N.C. contacts	51-462.036	51-482.036	51-472.036
1 N.O., 1 N.C.	51-463.036	51-483.036	51-473.036
1 N.O. contact	51-465.036	51-485.036	51-475.036
1 N.C. contact	51-466.036	51-486.036	51-476.036

Combined Momentary/Maintained

Switch Element	Rectangular	Square	Round
Snap Action, Form Z			
Momentary 1PDT and Maintained 1PDT	51-101.0 □ 5	51-104.0 □ 5	51-107.0 □ 5
Momentary 1PDT and Maintained 2PDT	51-102.0 □ 5	51-105.0 □ 5	51-108.0 □ 5
Momentary 2PDT and Maintained 1PDT	51-103.0 □ 5	51-106.0 □ 5	51-109.0 □ 5

Select contact and terminal type where applicable

.0 □ □

1st digit is always 0 (Case color is black)

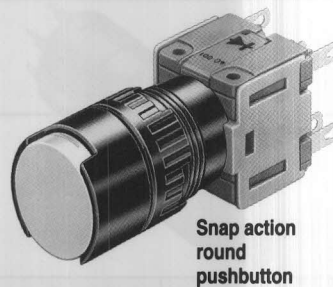
Contact material (2nd digit): 1 = Silver, 2 = Gold over silver

Terminal type (3rd digit): 2 = 0.110" Q.C., 5 = Solder

Reference

International Approvals	page 3
Accessories	page 82
Lamps	page 94
Legends	page 100
Technical Specifications	page 104

To order: Series 51: first select pushbutton or indicator desired, indicating contact and terminal type where applicable. Then order lens and illumination separately. If pushbutton with contact block is desired, order actuator, contact block, lens, and illumination separately. Series 52: order rotary switch indicating contact and terminal type where applicable. Then order lever cap and illumination.



Snap action round pushbutton



Low level square pushbutton

Lighted Indicators

Description	Rectangular	Square	Round
For 0.110" Q.C. terminals	51-040.002	51-050.002	51-030.002
Solder terminals	51-040.005	51-050.005	51-030.005
Length matches low level and universal terminals	51-041.006	51-050.006	51-031.006

Lenses

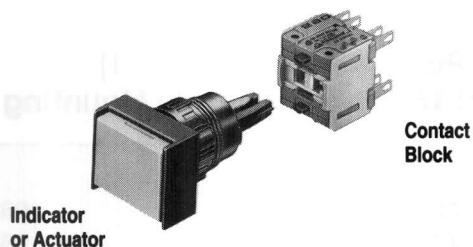
□ Add color digit

Description	Rect.	Square	Round	0	1	2	3	4	5	6	7	8	9
Flat Lens													
Translucent	51-901.□	51-951.□	51-931.□	✓		✓	✓	✓	✓	✓		✓	✓
Transparent	51-903.□	51-953.□	51-933.□		✓	✓	✓	✓	✓	✓	✓		
Transparent with clear diffuser	51-905.□	51-955.□	51-935.□			✓		✓	✓		✓		
Concave													
Translucent	51-902.□	51-952.□	--	✓		✓	✓	✓	✓	✓		✓	✓
Transparent	51-904.□	51-954.□	--			✓	✓	✓	✓	✓	✓		
Transparent with clear diffuser	51-906.□	51-956.□	--			✓		✓	✓		✓		

□ 0 = Black, 1 = Solar Black*, 2 = Red, 3 = Orange, 4 = Yellow, 5 = Green, 6 = Blue
7 = Clear, 8 = Gray, 9 = White. Black and Gray are opaque.

* Dead Front — Legend only visible when illuminated.

Oil & Watertight Switches and Indicators

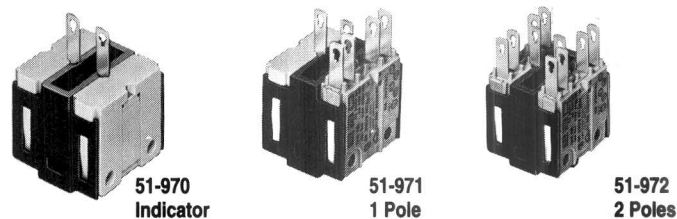


Series 51 Pushbuttons and Indicators without Snap Action Contact Blocks

(Order lamp and lens separately)

Description	Rectangular	Square	Round
Momentary pushbutton actuator without contact block	51-165.0	51-185.0	51-175.0
Maintained pushbutton actuator without contact block	51-265.0	51-285.0	51-275.0
Indicator without element block	51-042.0	51-052.0	51-032.0

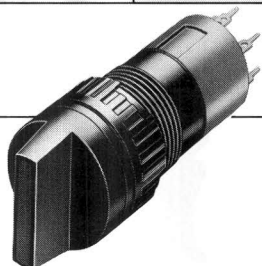
Contact Block & Indicator Element



Description	Part Number	Suffix Numbers	
		Contact Material	Terminal Type
Element block for Indicator	51-970.0	0	2
Contact block with 1 pole	51-971.0	2	2
Contact block with 2 poles	51-972.0	2	2

Series 52 Lighted Two-Position Rotary Switch

(Order lens cap and lamp separately)



Switch Elements	Momentary	Maintained
Snap Action		
1-pole Form Z	52-131.0 <input type="checkbox"/> <input type="checkbox"/>	52-271.0 <input type="checkbox"/> <input type="checkbox"/>
2-pole Form Z	52-132.0 <input type="checkbox"/> 5	52-272.0 <input type="checkbox"/> 5
3 pole Form Z	52-133.0 <input type="checkbox"/> 5	52-273.0 <input type="checkbox"/> 5
4 pole Form Z	52-134.0 <input type="checkbox"/> 5	52-274.0 <input type="checkbox"/> 5
Low Level		
2 N.O. contacts	52-431.036	52-471.036
2 N.C. contacts	52-432.036	52-472.036
1 N.O., 1 N.C.	52-433.036	52-473.036
1 N.O. contact	52-435.036	52-475.036
1 N.C. contact	52-436.036	52-476.036

Select contact and terminal type where applicable

.0 ☐ ☐

1st digit is always 0 (Case color is black)

Contact material (2nd digit): 1 = Silver, 2 = Gold over silver

Terminal type (3rd digit): 2 = 0.110" Q.C., 5 = Solder

Square Bezel Insert

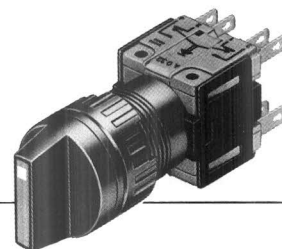
To change round bezel to square bezel



Description	Part Number
To change round bezel to 24 x 24 mm	52-950.0
To change round bezel to 26 x 26 mm	52-952.0

Lighted Three-Position Rotary Switch

Includes contact block (Order lens cap and lamp separately)



Description	Part Number
Position A — always maintained with no operation of switch elements Position B & C — operate independent SPDT switch element	
Positions B, C — Maintained	52-571.022A
Positions B, C — Momentary	52-572.022A
Position B — Momentary, Position C — Maintained	52-573.022A
Position B — Maintained, Position C — Momentary	52-574.022A

With Indicating Dot



Lens Cap

☐ Add color digit

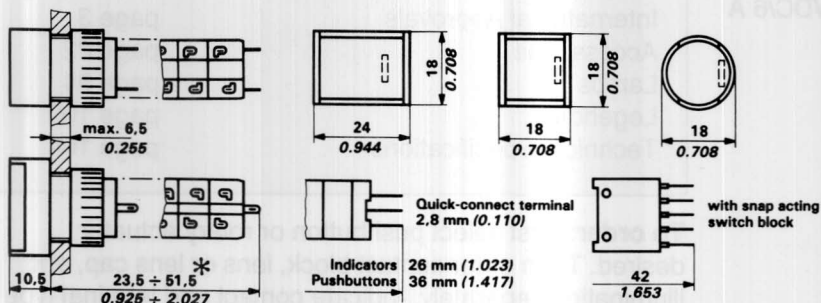
Lens Cap with Translucent Colored Window	Part Number	
	Black Lens Cap	Gray Lens Cap
with indicating dot	52-928. <input type="checkbox"/>	52-929. <input type="checkbox"/>

☐ Select color of translucent window

0 = Black, 2 = Red, 3 = Orange, 4 = Yellow, 5 = Green, 6 = Blue, 8 = Gray, 9 = White. Black and Gray are opaque. **NOTE:** Black lens cap not available with Gray window, Gray lens cap not available with Black window

Oil & Watertight Switches and Indicators

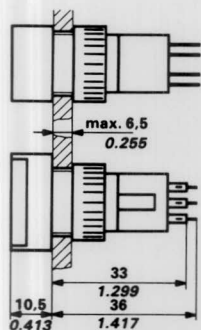
Series 51/52 Dimensions & Mounting Information



* Front-of-Panel to end of switch length:
 1 pole, 29 (1.14)
 2 pole, 36.5 (1.44)

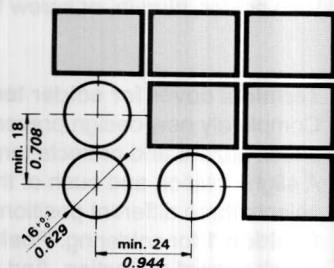
Indicator, 23.5 (0.925)
 3 pole, 44 (1.73)
 4 pole, 51.5 (2.03)

Series 51 — Snap Action

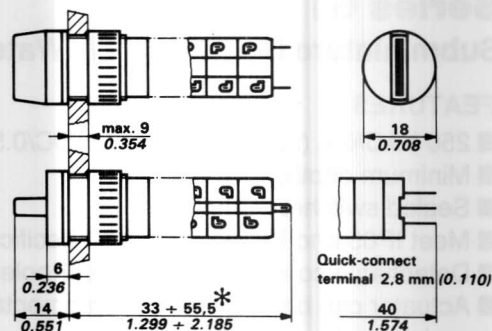
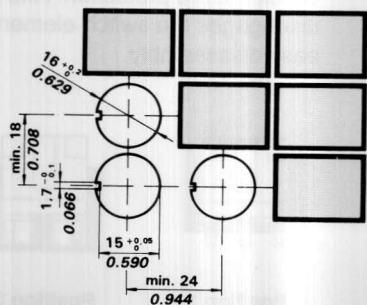


Series 51 — Low Level

Not Secured Against Rotation,
 Indicators & Pushbuttons

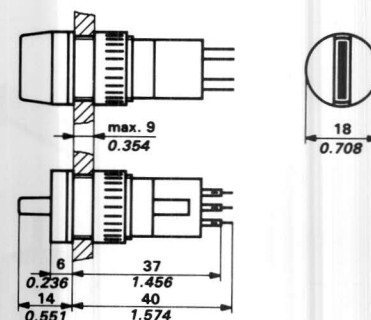


Secured Against Rotation,
 Rotary Switches

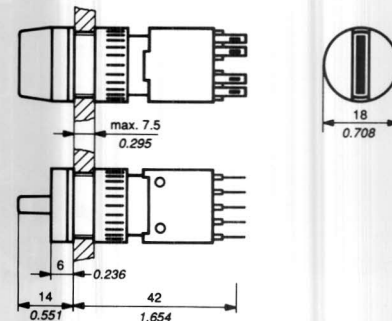


Series 52 — Snap Action

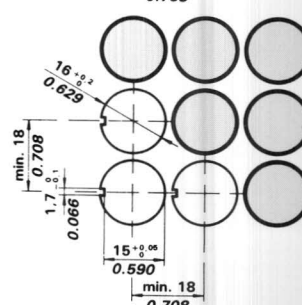
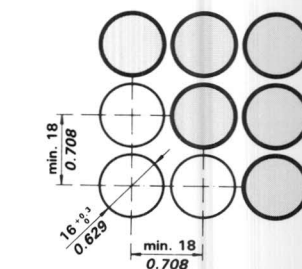
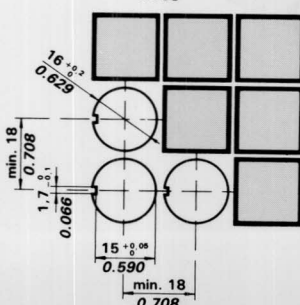
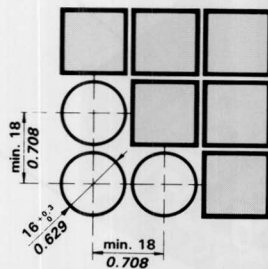
* Front of panel to end of switch length:
 1 pole, 33 (1.30)
 2 pole, 40.5 (1.59)
 3 pole, 48 (1.89)
 4 pole, 55.5 (2.19)



Series 52 — Low Level



Series 52 — Three-Position with Contact Block



Oil & Watertight Switches and Indicators

Series 61

Subminiature Modular Oil & Watertight Switches and Indicators

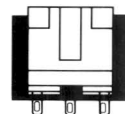
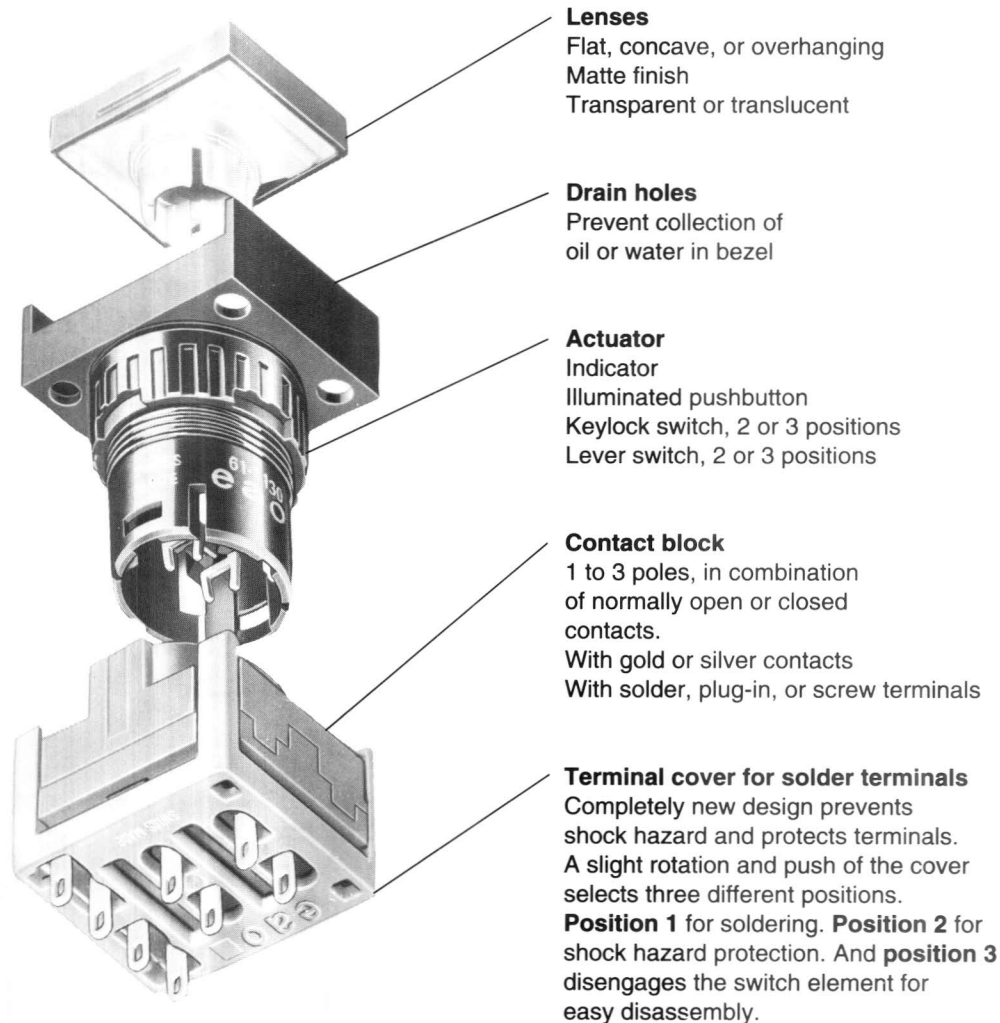
FEATURES

- 250 VAC/6 A (screw term.), 220 VDC/0.5 A, 24 VDC/6 A
- Minimum depth: 1.54"
- Sealed switches
- Meet IP65 and NEMA 4 and 13 specifications
- Detachable contact blocks, up to 3 poles
- Actuator can be changed from momentary to maintained
- Drain holes in bezel
- Recessed mounting adapter available

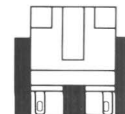
Reference

International Approvals	page 3
Accessories	page 82
Lamps	page 94
Legends	page 100
Technical Specifications	page 104

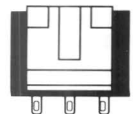
To order: First select pushbutton or rotary actuator desired. Then order contact block, lens or lens cap, and illumination separately. Indicate contact and terminal type where applicable



Position 1



Position 2

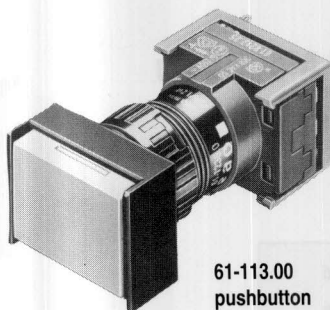


Position 3

Oil & Watertight Switches and Indicators



61-002.002
indicator



61-113.00
pushbutton



61-344.041

Series 61 Lighted Pushbutton Actuators & Indicators

(order contact block, lamp, and lens separately)

Description Actuator	Rect.	Square		Round	
		24 x 24 mm	18 x 18 mm	24 mm*	18 mm
Momentary action	61-113.00	61-115.00	61-112.00	61-114.00	61-111.00
Maintained action	61-123.00	61-125.00	61-122.00	61-124.00	61-121.00
Convertible action*	61-133.00	61-135.00	61-132.00	—	61-131.00
Indicator, complete	61-003.002	61-005.002	61-002.002	61-004.002	61-001.002

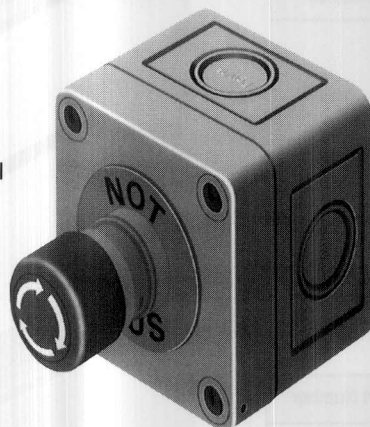
Terminal, indicator only: 0.110" Q.C. plug-in or solder

* Order front ring separately; see page 41.

Enclosure for Emergency Stop Pushbutton

The bright yellow enclosure is sealed to NEMA 4 & 13 and IP 65. It is particularly useful for surface mounting Series 61 emergency stop pushbuttons. Enclosure dimensions are: 65 x 65 x 57 mm (2.56 x 2.56 x 2.25 inches). A cable feed-thru seal is available.

Description	Part Number
Surface-mounted enclosure	61-948.04
Cable feed-thru seal for enclosure	61-948.18

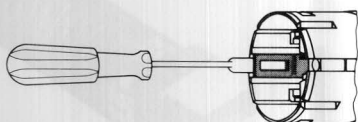


* Convertible Actuator

There is a choice of three pushbutton actuators: momentary, maintained, and convertible. Convertible actuators may be changed from momentary to maintained action, as shown below. Once converted, they can not be changed back.

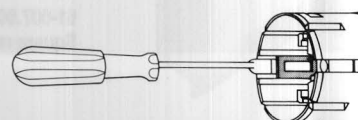
To convert: Push the metallic part shown with a small screwdriver until it reaches the end of its travel.

Momentary action



(Conversion only from momentary to maintained action.)

Maintained action



Emergency Stop Actuators

Twist to release

Emergency stop switches are operated by simply pushing on the front cap to immediately break the circuit. They then may be released to reactivate the circuit by turning the front cap clockwise by hand. See Keylock section for key release actuators.

Emergency Stop Actuators

(Order slow-make contact block and marking plate separately)

Description	Marking on Knob	Part Number
Twist to release		61-344.041
Twist to release		61-344.042

Emergency Pushbutton Marking Plate

Yellow circular plate, 43 mm (1.69") diameter

Blank

Marked "Emergency Stop"



61-997.00

61-997.02

Contact Blocks for Emergency Stop Pushbuttons

Description	Contacts	Part Number
1PST, N.C. Slow-make		61-874.5 <input type="checkbox"/> <input type="checkbox"/>
2PST, 2 N.C. Slow-make		61-875.5 <input type="checkbox"/> <input type="checkbox"/>
2PST, 1 N.O./1 N.C. Slow-make		61-877.5 <input type="checkbox"/> <input type="checkbox"/>

☐ Select contact and terminal type

Contact material (2nd digit): 1 = Silver, 3 = Gold

Terminal type (3rd digit): 1 = Screw (silver contact only), 7 = 0.110 Q.C. or solder

Oil & Watertight Switches and Indicators

Series 61 Pushbutton Actuators, Indicators, and Flashers with Overhanging Lenses and Recessed Mounting

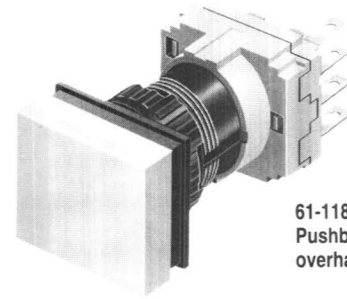
Series 61 Lighted Overhanging Lens Pushbutton Actuators & Indicators

(order lens, lamp, and contact block separately.)

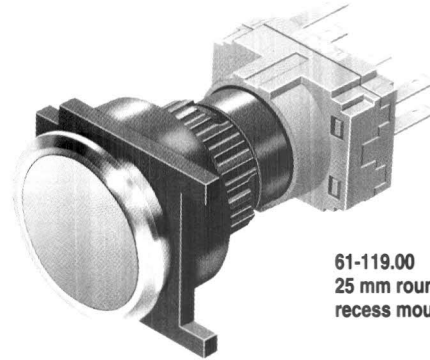
If recessed mounting is desired, order adapter separately)

Description	Rect.	Square	Round
Actuator	18 x 24 mm	18 x 18 mm	25 mm
Momentary action	61-118.00	61-117.00	61-119.00*
Maintained action	61-128.00	61-127.00	61-129.00*
Convertible action	61-138.00	61-137.00	—
Indicator, complete	61-008.002	61-007.002	61-009.002 *

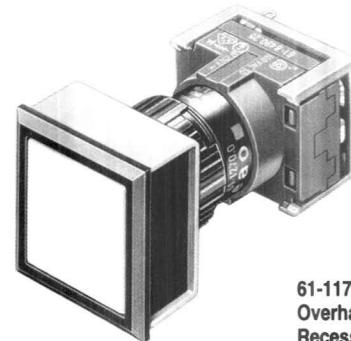
Terminal, indicator only: 0.110" Q.C. plug-in or solder



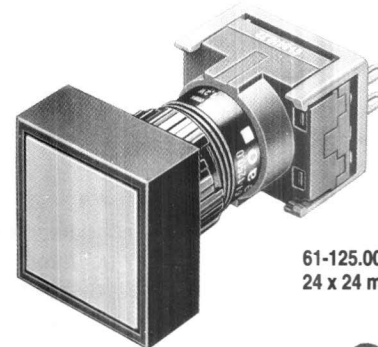
61-118.00
Pushbutton with
overhanging lens



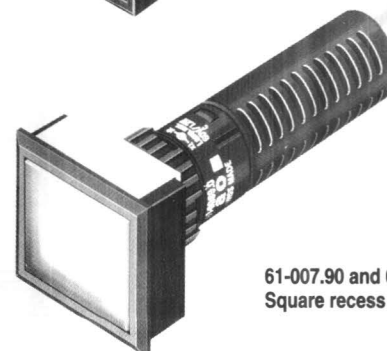
61-119.00
25 mm round pushbutton,
recess mounted



61-117.00
Overhanging lens pushbutton,
Recess mounted



61-125.00
24 x 24 mm pushbutton



61-007.90 and 61-800.002
Square recess mounted flasher

Series 61 Overhanging Lens Indicator & Flasher with separate element block

(Order lens, lamp, and lamp element separately for indicator)

(Order lens, lamp, and flasher element separately for flasher)

Description	Rect.	Square	Round
	18 x 24 mm	18 x 18 mm	25 mm
Indicator Sleeve	61-008.90	61-007.90	61-009.90*
Element Blocks			
Description	Terminals		Part Number
Indicator lamp element	screw		61-800.601
Flasher element	Solder		61-800.005

* Supplied complete for recessed mounting only, except for lens and diffuser or mushroom cap. Cannot be supplied without recessed mounting feature. See drawings on page 44.

Recessed Mounting Adapters

(Two pieces and sealing gasket)

Description	Finish	Part Number
24 x 24 mm Square	Black Chromium-plated	61-993.00 61-993.04
24 x 30 mm Rectangular	Black chromium-plated	61-993.10 61-993.14

Series 61 Indicator & Flasher with element block to match pushbutton

(Order lens, lamp, and lamp element or flasher element separately)

Description	Rect.	Square		Round	
		24 x 24 mm	18 x 18 mm	24 mm	18 mm
Indicator Sleeve	61-003.90	61-005.90	61-002.90	61-004.90	61-001.90
Element Blocks					
Description	Terminals		Part Number		
Indicator element	screw		61-800.601		
Flasher element	Solder		61-800.005		

Oil & Watertight Switches and Indicators

Series 61 Lenses – Matte Finish

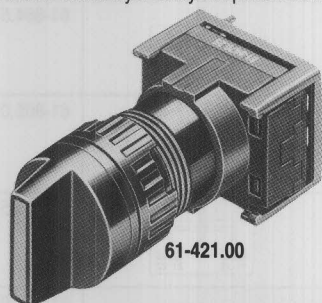
☐ Add color digit

Description	For Rect Bezel 18 x 24 mm	For Square Bezel		For Round Bezel		Overhanging Lens		Color									
		24 x 24 mm	18 x 18 mm	24/25 mm	18 mm	18 x 24 mm	18 x 18 mm	0	1	2	3	4	5	6	7	8	9
Flat Lens																	
Translucent	61-923.1 <input type="checkbox"/>	61-925.1 <input type="checkbox"/>	61-922.1 <input type="checkbox"/>	—	61-921.1 <input type="checkbox"/>	61-928.1 <input type="checkbox"/>	61-927.1 <input type="checkbox"/>	✓		✓	✓	✓	✓	✓		✓	✓
Transparent	61-933.1 <input type="checkbox"/>	61-935.1 <input type="checkbox"/>	61-932.1 <input type="checkbox"/>	61-964.2 <input type="checkbox"/>	61-931.1 <input type="checkbox"/>	61-938.1 <input type="checkbox"/>	61-937.1 <input type="checkbox"/>		✓	✓	✓	✓	✓	✓	✓		
Concave																	
Translucent	61-923.6 <input type="checkbox"/>	—	61-922.6 <input type="checkbox"/>	—	—	—	—	✓		✓	✓	✓	✓	✓		✓	✓
Transparent	61-933.6 <input type="checkbox"/>	—	61-932.6 <input type="checkbox"/>	—	—	—	—			✓	✓	✓	✓	✓	✓		
Lens (Anodized Al)	—	—	—	61-984.1 <input type="checkbox"/>	—	—	—	✓		✓		✓	✓	✓		✓*	
Diffuser	—	—	—	61-970.77	—	—	—								✓		
Mushroom Cap†	—	—	—	61-959.3 <input type="checkbox"/> †	—	—	—	✓		✓		✓	✓				
Front Ring (Anodized Al)	—	—	—	61-960.01	—	—	—										

☐ 0 = Black, 1 = Smoked, 2 = Red, 3 = Orange, 4 = Yellow, 5 = Green, 6 = Blue, 7 = Clear, 8 = Gray, 9 = White.

Black and grey are opaque. All anodized aluminum lenses are opaque. * Natural anodized aluminum. † 32 mm diameter, all mushroom caps are opaque.

NOTE: 24 mm round style always requires a front ring. If using a transparent lens, a diffuser is required. If using an aluminum lens or mushroom cap, no diffuser is needed.



61-421.00





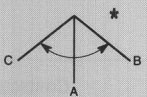
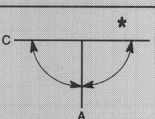
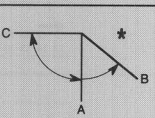
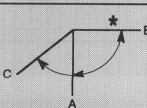
61-114.00
Round pushbutton



61-114.00
Pushbutton with aluminum front ring and mushroom cap

Series 61 Lighted Two- and Three-Position Rotary Actuators

(Order lens cap, lamp, and contact block separately)

Description	Positions	Part Number
2-position Momentary		61-411.00
2-position Maintained		61-421.00
3-position Momentary at C & B		61-451.00
3-position Maintained at C & B		61-461.00
3-position C Maintained B Momentary		61-471.00
3-position C Momentary B Maintained		61-481.00

* Position B operates terminals 21-22 or 23-24. Position C, terminals 11-12 or 13-14.

Lens Cap

☐ Add color digit

With Indicating Dot



Lens Cap with Translucent Colored Window	Part Number	
	Black Lens Cap	Gray Lens Cap
with indicating dot	52-928. <input type="checkbox"/>	52-929. <input type="checkbox"/>

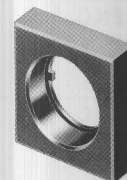
☐ Select color of translucent window

0 = Black, 2 = Red, 3 = Orange, 4 = Yellow, 5 = Green, 6 = Blue, 8 = Gray, 9 = White. Black and Gray are opaque.

NOTE: Black lens cap not available with Gray window
Gray lens cap not available with Black window

Square Bezel Insert

To change round bezel to square bezel



Description	Part Number
To change round bezel to 24 x 24 mm	52-950.0
To change round bezel to 26 x 26 mm	52-952.0

Oil & Watertight Switches and Indicators

Contact Blocks for Pushbuttons and 2-Position Rotary Switches

Snap-action

(Select contact type)

Description	Contacts	Part Number
1PST, N.O.		61-841.0 □ 2
2PST, N.O.		61-842.0 □ 2
3PST, N.O.		61-843.0 □ 2
1PST, 1 N.C.		61-844.0 □ 2
2PST, 2 N.C.		61-845.0 □ 2
3PST, 3 N.C.		61-846.0 □ 2
2PST, N.O./N.C.		61-847.0 □ 2
3PST, N.O./2 N.C.		61-848.0 □ 2
3PST, 2 N.O./N.C.		61-849.0 □ 2

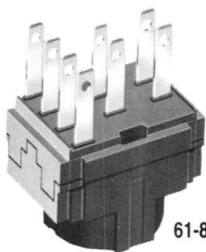
Select contact

□ 2

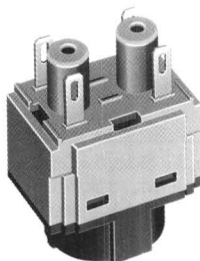
Contact material (2nd digit): 1 = Silver, 2 = Gold over silver

Terminal: 0.110" Q.C. plug-in or solder

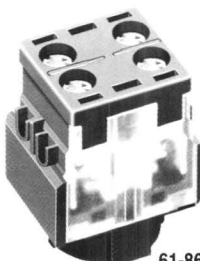
NOTE: Any switch block with other than solder terminals requires Dismantling Tool 61-971.10 for removal from actuator.



61-843.022



61-875.017



61-865.511

Slow-Make

(Select contact and terminal type)

Description	Contacts	Part Number
1PST, N.O.		61-861.0 □ □
1PST, N.O.		61-861.511
2PST, N.O.		61-862.0 □ 7
2PST, N.O.		61-862.511
1PST, 1 N.C.		61-864.0 □ □
1PST, 1 N.C.		61-864.511
2PST, 2 N.C.		61-865.0 □ 7
2PST, 2 N.C.		61-865.511
2PST, N.O./N.C.		61-867.0 □ 7
2PST, N.O./N.C.		61-867.511

Select contact and terminal type where applicable

□ □

Contact material (2nd digit): 1 = Silver, 3 = Gold* (slow make only)

Terminal type (3rd digit): 1 = Screw (silver contacts only), 7 = 0.110" Q.C. or solder

* Low level to 42 V AC/100 mA.

Contact Blocks for 3-Position Rotary Switches

(Select contact and terminal type where applicable)

Description	Contacts	Part Number
2PST, 2 N.O. Snap-action Slow-make		61-852.0 □ □ 61-872.0 □ 7
2PST, 2 N.O. Slow-make		61-872.511
2PST, 2 N.C. Snap-action Slow-make		61-855.0 □ □ 61-875.0 □ 7
2PST, 2 N.C. Slow-make		61-875.511

Description	Contacts	Part Number
2PST, N.C./N.O. Snap-action		61-857.0 □ □
2PST, N.O./N.C. Snap-action Slow-make		61-857.4 □ □ 67.877.0 □ 7
2PST, N.O./N.C. Slow-make		61-877.511

□ □ Select contact and terminal type where applicable

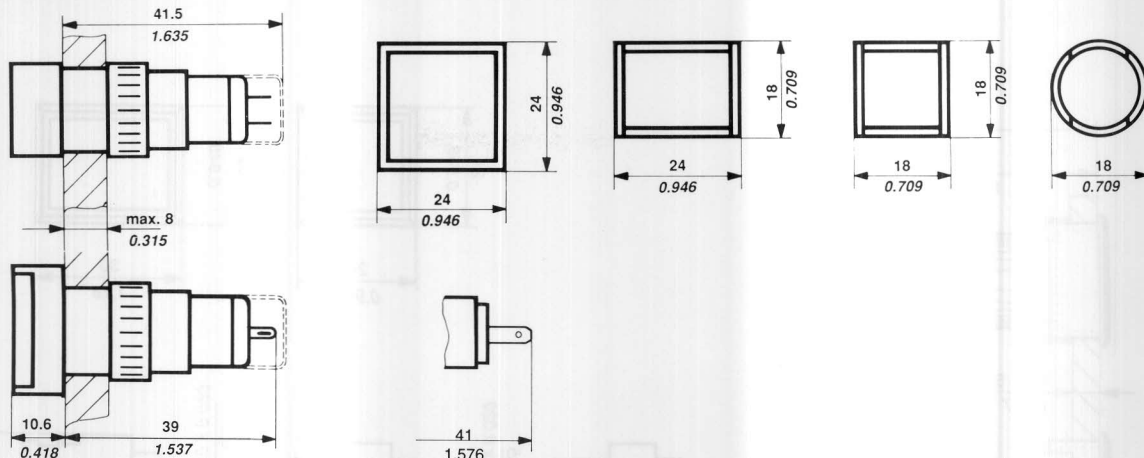
Contact material (2nd digit): 1 = Silver, 2 = Gold over silver (snap-action only), 3 = Gold (slow-make only).

Terminal type (3rd digit): 1 = Screw (slow-make and silver contacts only), 2 = 0.110" Q.C. plug-in or solder (snap-action only), 7 = 0.110" Q.C. or solder (slow-make only)

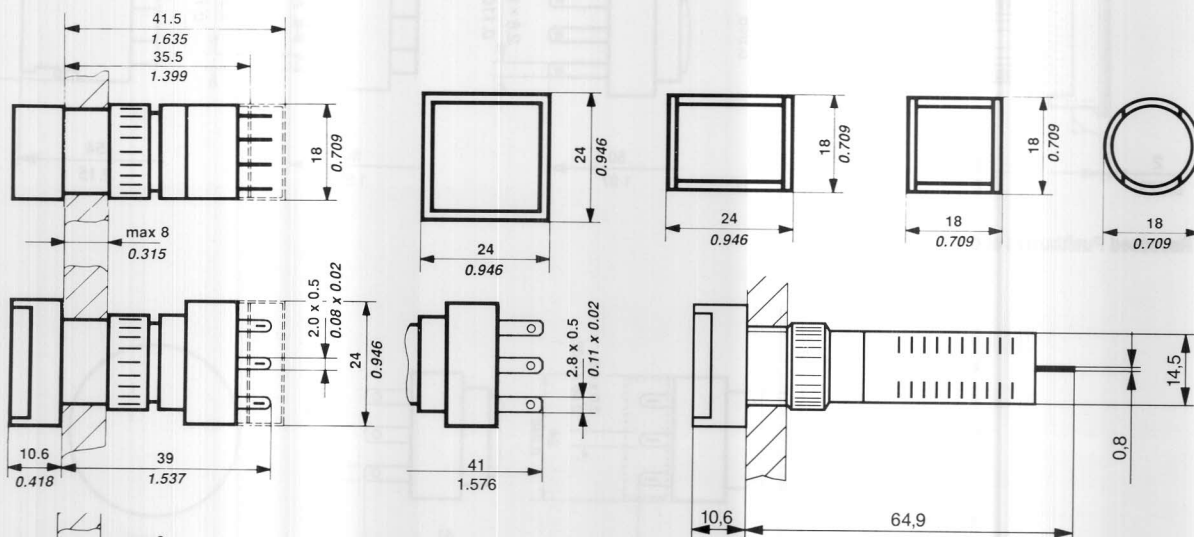
Oil & Watertight Switches and Indicators

Series 61 Dimensions & Mounting Information

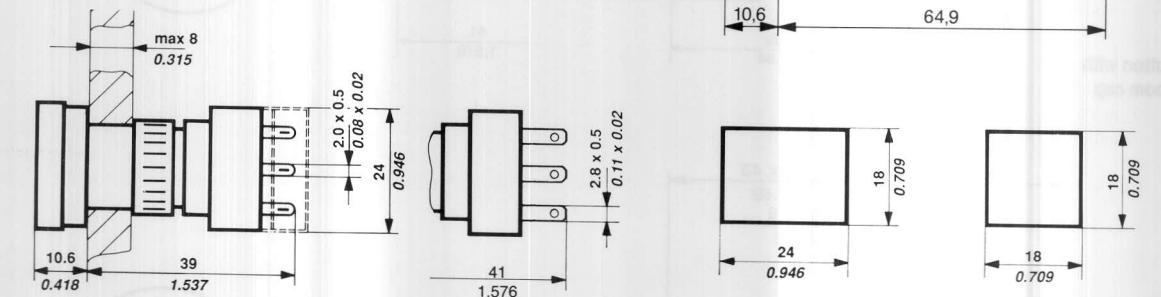
Indicator



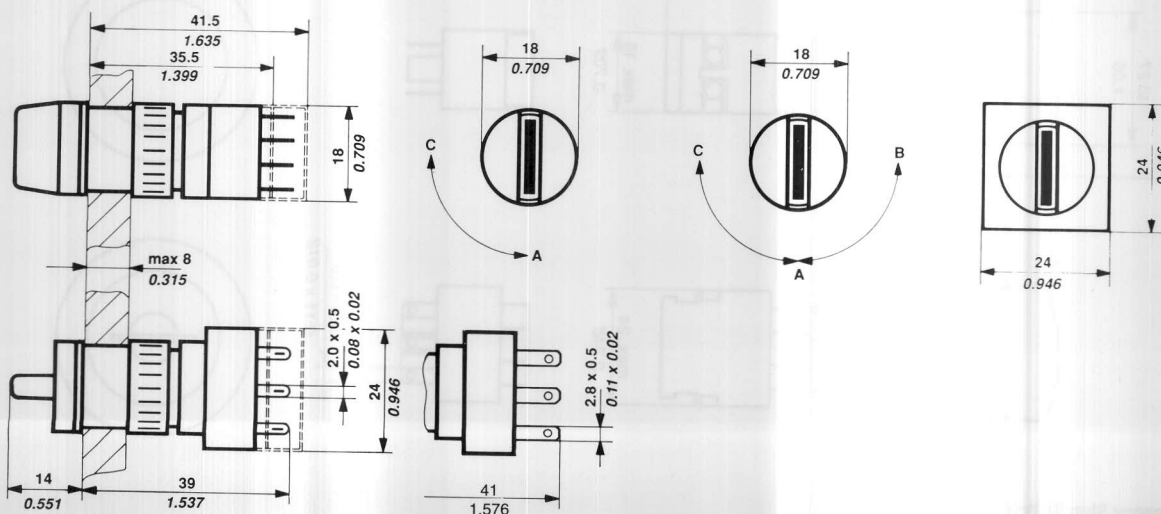
Pushbutton, indicator, flasher



Pushbutton with overhanging lens

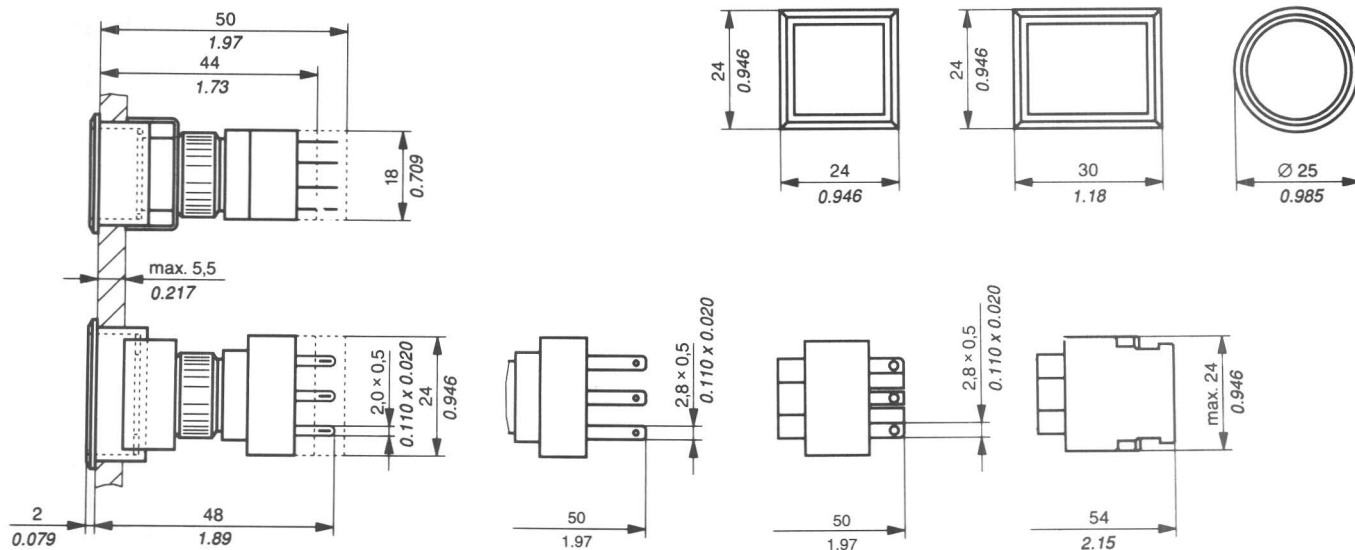


Rotary switch

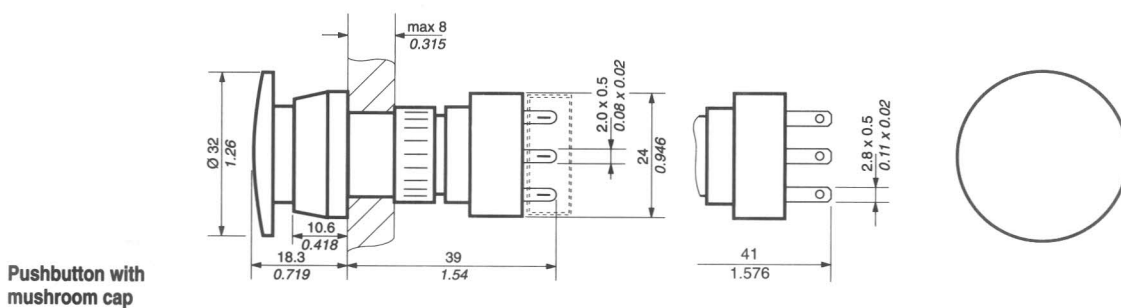


Oil & Watertight Switches and Indicators

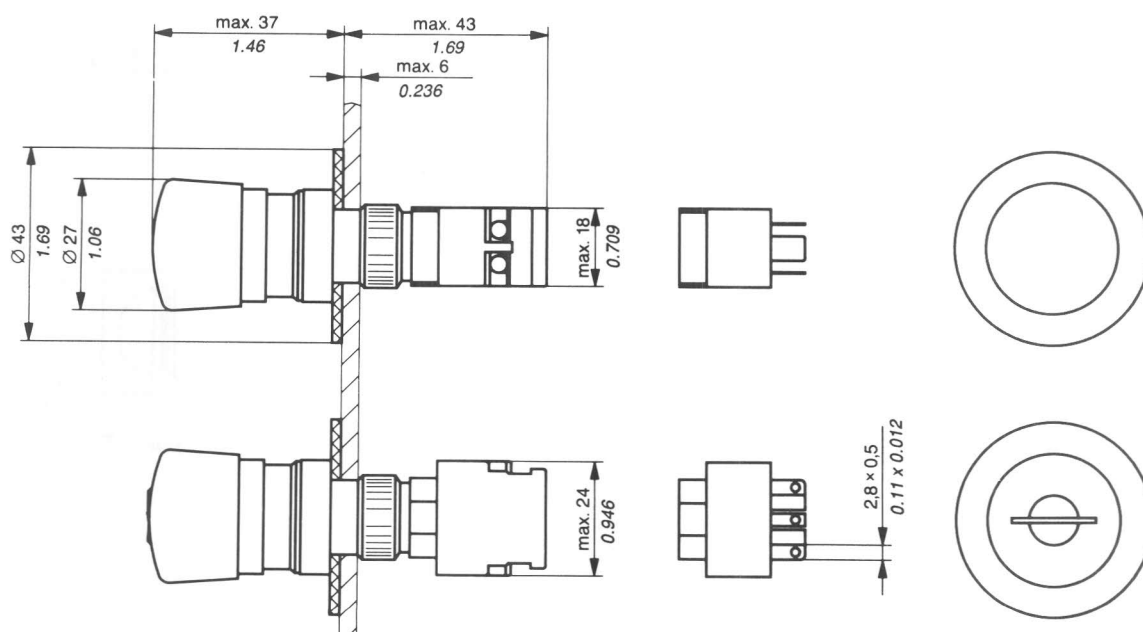
Series 61 Dimensions & Mounting Information



Recessed Pushbutton and indicator



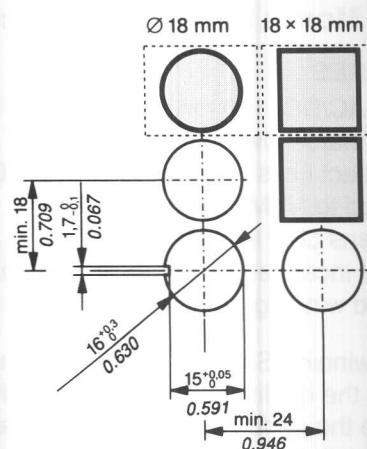
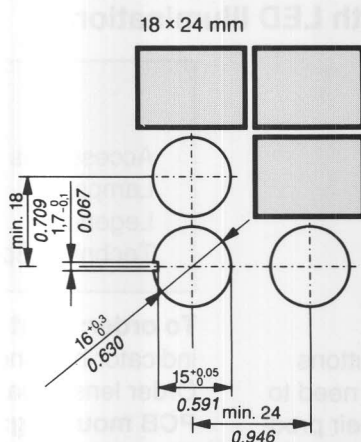
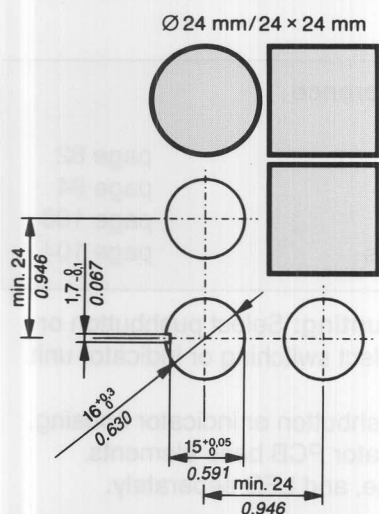
Pushbutton with mushroom cap



Emergency Stop Switch

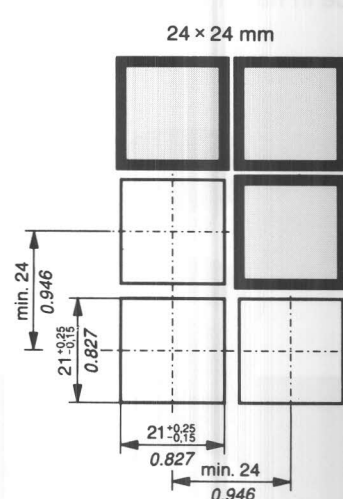
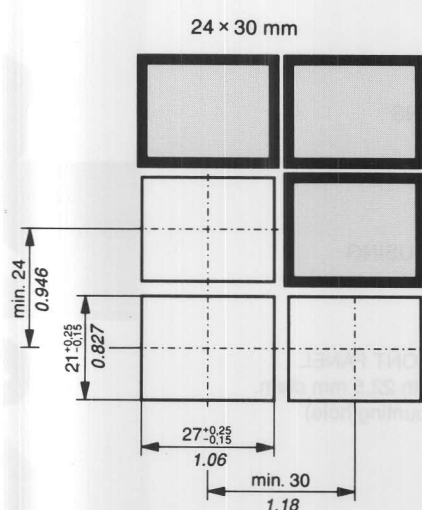
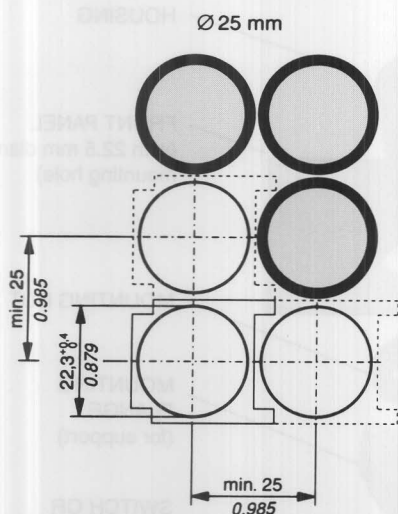
Oil & Watertight Switches and Indicators

Series 61 Dimensions & Mounting Information

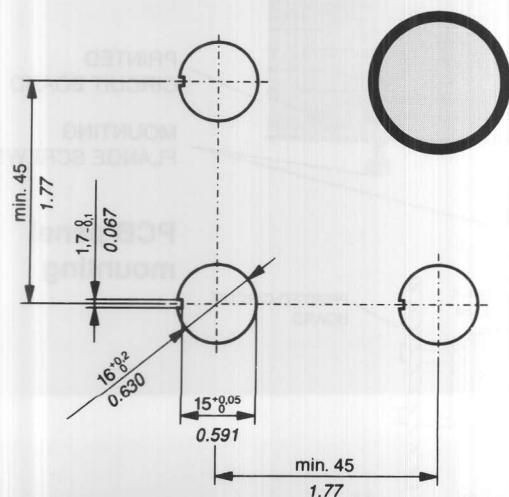


Pushbutton, indicator, rotary switch

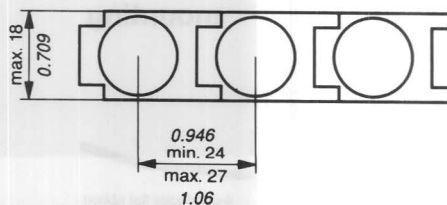
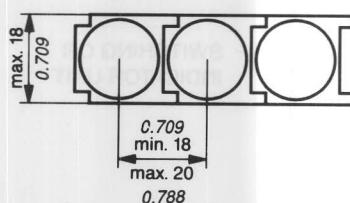
To prevent pushbutton or rotary switch rotation, punching tool (Part no. 51-999) produces an anti-rotation projection in the mounting hole. Anti-rotation locking washer (Part no. 51-910) also is available.



Pushbutton, indicator, rotary switch, recessed mounting



Emergency stop switch



Indicator, pushbutton, rotary switch

Layout with alignment plate (Part no. 61-991.1 for 18 mm, Part no. 9910 for 24 mm)

Oil & Watertight Switches and Indicators

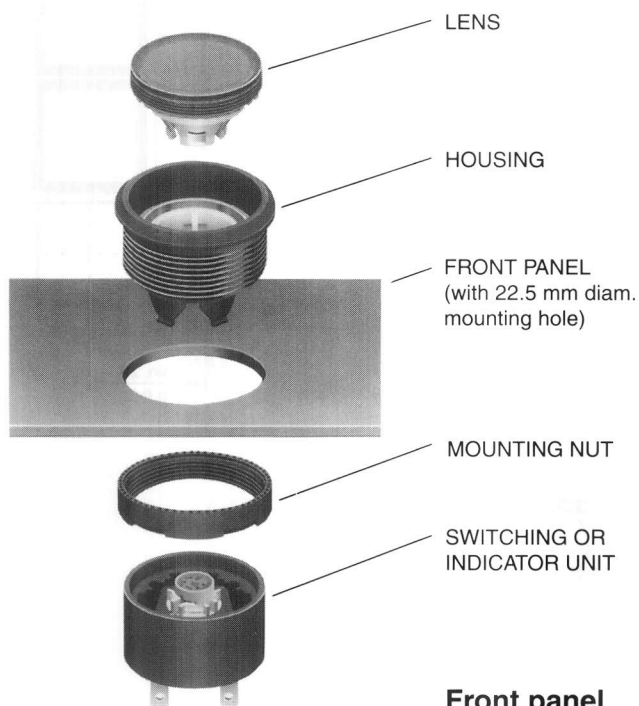
Series 84

Flush Mount Switch and Indicator with LED Illumination

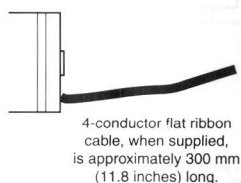
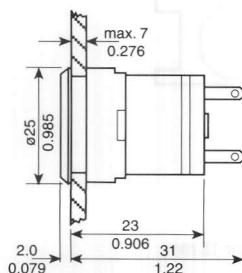
FEATURES

- 42 V AC/DC, 100 mA
- Gold plated low-level contacts
- Compact units mount on panel or PCB
- Sealed to NEMA 4 & 13 (IP 67)
- Full lens LED illumination
- Bright incandescent illumination available
- Award winning Eurostyle design

Award winning Series 84 indicators and pushbuttons provide the quality and flexibility that designers need to improve the performance and appearance of their products. Installation flexibility offers front panel or PCB mounting. Termination flexibility means QC, PCB, or ribbon cable. Appearance flexibility provides modern flush mount design with a choice of natural anodized aluminum or black plastic housing and a wide selection of lenses. This versatility is coupled with a smooth acting, tactile feel switching mechanism that provides years of dependable service in harsh industrial environments.



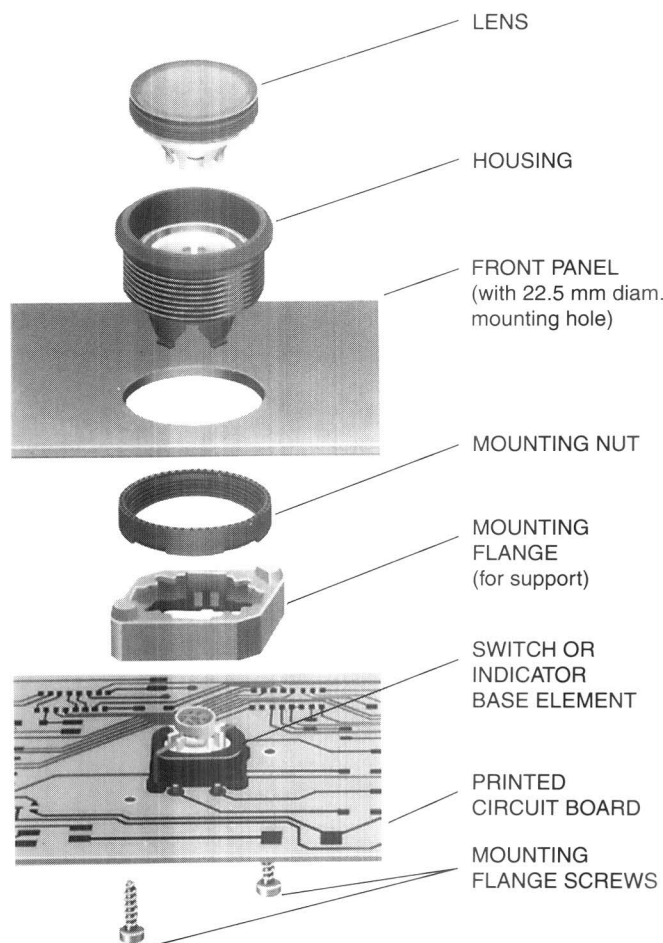
Front panel mounting



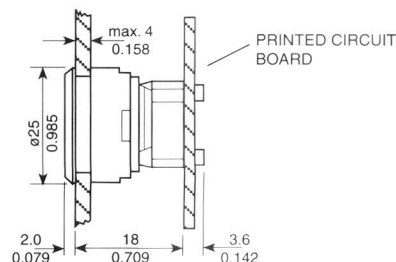
Reference	
Accessories	page 82
Lamps	page 94
Legends	page 100
Technical Specifications	page 104

To order: front panel mounting: Select pushbutton or indicator housing. Then select switching or indicator unit. Order lens separately.

PCB mounting: Select pushbutton or indicator housing. Then select switch or indicator PCB base elements. Order lens, mounting flange, and LED separately.



PCB panel mounting



Oil & Watertight Switches and Indicators

Front Panel Mounting

Indicators

Select housing and indicator unit; order lens separately ☐ Add LED color digit

Housing	Part Number
Black plastic	84-0100.0
Anodized natural aluminum	84-0200.7
Indicator unit	LED
QC plug-in/solder terminals	84-8002.□620
Flat ribbon cable	84-8002.□640



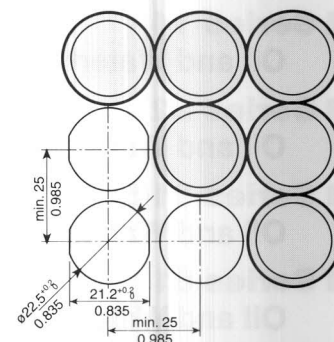
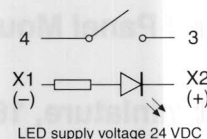
Lighted & Non-Lighted Pushbuttons

Select housing and switching unit; order lens separately ☐ Add LED color digit

Housing	Part Number		
Black plastic	84-1101.0		
Anodized natural aluminum	84-1201.7		
Switching unit	Illuminated* (LED)	Illuminated* (Incand)	Non-Illuminated
QC plug-in/solder terminals	84-8512.□620	84-8513.9620 (clear) 84-8513.6620 (blue)	84-8510.0020
Flat ribbon cable	84-8512.□640	—	84-8510.0040

□ Color: 2 = Red, 3 = Orange, 4 = Yellow, 5 = Green

* LED supply voltage: 24 VDC, Incandescent lamp voltage: 24 VDC (blue unit has blue cap)



Mounting Holes

Printed Circuit Board Mounting

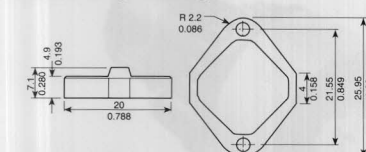
Indicator & Pushbutton Elements

Select indicator or pushbutton housing and appropriate PCB base elements then order lens, mounting flange, and LED separately

Housing	Indicator	Pushbutton
Black plastic	84-0100.0	84-1101.0
Anodized natural aluminum	84-0200.7	84-1201.7
PCB Elements		
Indicator base element	92-800.042	—
Switch base element	—	92-851.342

See Series 92 (page 65) for further information about PCB elements.

Mounting Flange



LEDs

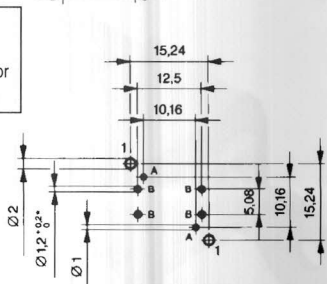
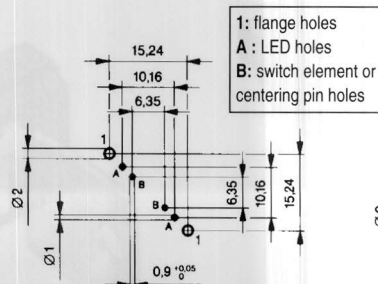
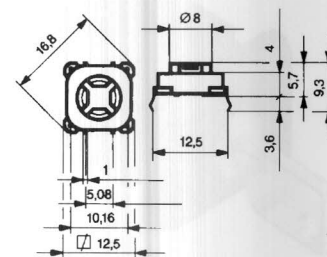
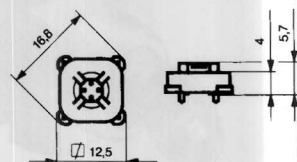
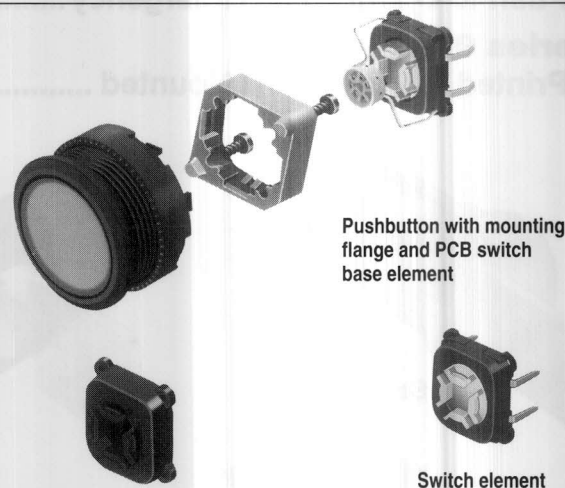
See "Lamps & Legends"

Lenses for all housings

☐ Add color digit

	Part Number	0	2	3	4	5	6	7	8
Plastic lens	84-7111.□00		✓	✓	✓	✓	✓	✓	
Plastic lens (opaque)	84-7121.□00	✓							✓
Aluminum lens (opaque)	84-7201.□00	✓	✓		✓	✓	✓	✓	
Aluminum lens with window	84-7211.□00								✓

0 = Black, 2 = Red, 3 = Orange, 4 = Yellow, 5 = Green, 6 = Blue, 7 = Clear, 8 = Gray.
Black and gray are opaque.



Keylock Switches

EAO keylock switches provide the security and dependability required when system access must be controlled for safety, privacy, or other reasons. They are available with a wide range of electrical and mechanical specifications, key combinations, and mounting options. Emergency keylocks prevent unauthorized re-starting of equipment.

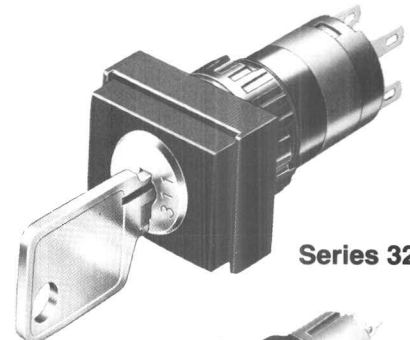
■ Series 15	
General Purpose, Low Cost, 3/4" Hole Mounting	47
■ Series 32	
General Purpose, Two-position, Silver Contacts	48
■ Series 04	
Oil and Watertight, Heavy Duty	49
■ Series 14	
Oil and Watertight, Snap Action and Low Level	52
■ Series 22	
Oil and Watertight, Front Panel Mounting	54
■ Series 31/51	
Oil and Watertight, Subminiature, 16 mm Hole Mounting	55
■ Series 61	
Oil and Watertight, Subminiature, Modular, 16 mm Mounting	58
■ Series 02/03	
Push to Operate and Emergency	61
■ Series 99	
Printed Circuit Board Mounted	63



Series 15



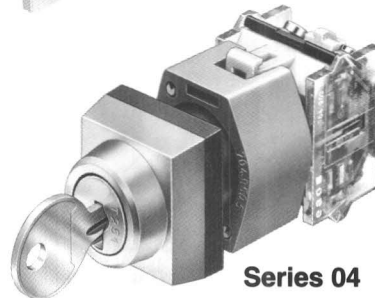
Series 31/51



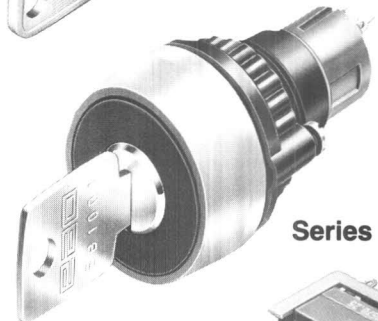
Series 32



Series 22



Series 04



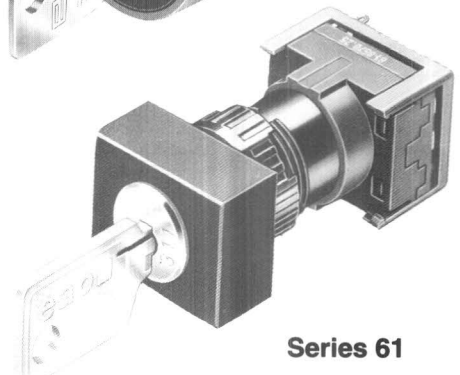
Series 14



Series 02



Series 31/51



Series 61

Keylock Switches — General Purpose

Series 15

Two position keylock switches
Low level to 5 amp switch elements

FEATURES

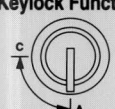
- 250 VAC/5A, 220 VDC/0.1 A, 24 VDC/2 A snap action
42 VAC/0.1 A, 42 VDC/0.1 A low level
- Minimum depth: 1.60"
- Low cost 3/4-inch mounting hole keylock
- Rugged quality and reliability
- Anti-static
- Choice of contact elements
- Low profile bezel

Reference

International Approvals	page 3
Accessories	page 82
Technical Specifications	page 104

To order: select keylock function and contact configuration, plus contact material and termination, when applicable.

Two Position Keylock Part Numbers Round Bezel, Bright Chrome Finish

Keylock Function	Contact Configuration	Contact Material	Contact Termination	Part Number
 Low level bifurcated contacts	1PST, N.O.	Gold	Universal	15-755.036
	2PST, N.O.	Gold	Universal	15-750.036
	2PST, 1N.O. 1 N.C.	Gold	Universal	15-752.036
Snap-acting double air break contacts (D.B.) 250 V AC/DC 5 amps	1PDT-D.B.	Silver	0.110" Q.C.	15-768.012
		Silver	Solder	15-760.015
		Gold	0.110" Q.C.	15-768.022
		Gold	Solder	15-760.025
	2PDT-D.B.	Silver	Solder	15-761.015
		Gold	Solder	15-761.025
	3PDT-D.B.	Silver	Solder	15-762.015
		Gold	Solder	15-762.025
	4PDT-D.B.	Silver	Solder	15-763.015
		Gold	Solder	15-763.025

Key removable in both positions.



Low-level switching element
15-755.036

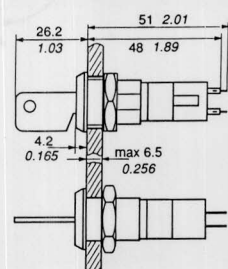


Snap-action switching element
with 0.110" Q.C. terminals
15-768.012

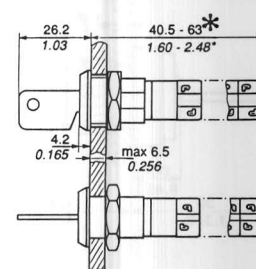


Snap-action switching element
with solder terminals
15-760.025

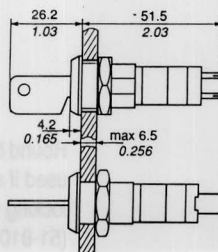
Dimensions & Mounting Information



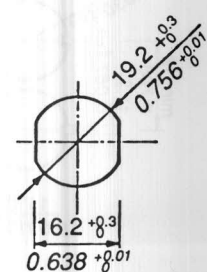
Low-level switching element



* Snap-action switching element
with solder terminals
1 pole, 40.5 (1.60) 3 pole, 55.5 (2.19)
2 pole, 48 (1.89) 4 pole, 63 (2.48)



Snap-action switching element
with 0.110" Q.C. terminals



Keylock Switches — General Purpose

Series 32

Low cost subminiature keylocks

FEATURES


- 250 VAC/5A, 220 VDC/0.1 A, 24 VDC/2A
- Minimum depth: 1.42"
- Anti-static
- Choice of bezel styles

Reference

International Approvals	page 3
Accessories	page 82
Technical Specifications	page 104

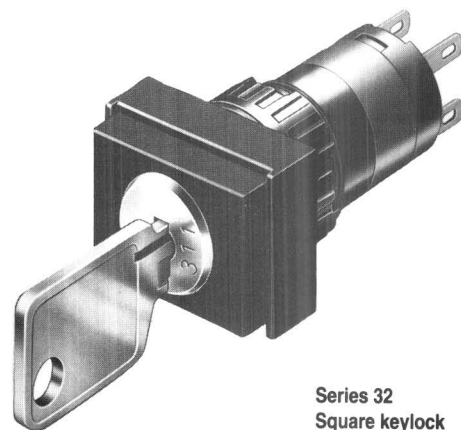
To order: select key removable positions plus bezel style

Two-Position Keylock Part Numbers

Keylock Function 	Key Removable		Bezel Style		
	C	A	Rectangular	Square	Round
Position A and	✓	✓	32-195.012	32-155.012	32-135.012
Position C Maintained		✓	32-295.012	32-255.012	32-235.012
1PDT Contact	✓		32-395.012	32-355.012	32-335.012

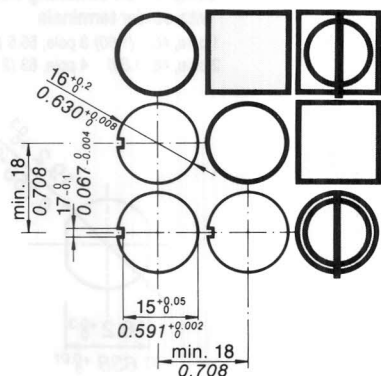
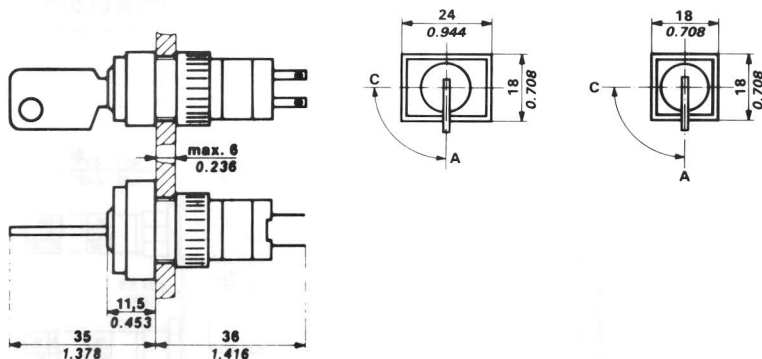


Series 32
Round keylock

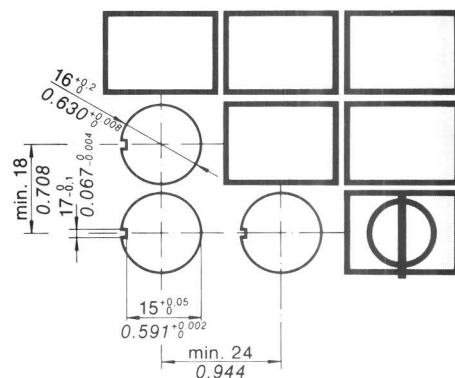


Series 32
Square keylock

Dimensions & Mounting Information



Round hole may be used if anti-rotation locking washer (51-910) is used to prevent rotation.

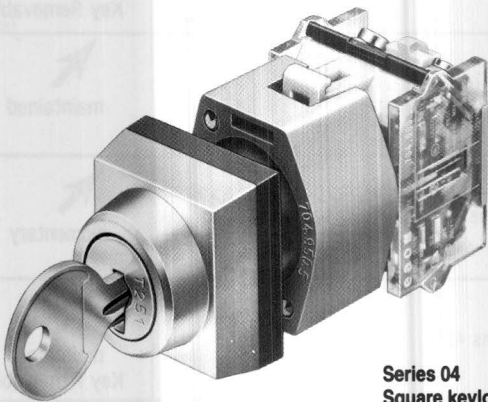


Keylock Switches — Oil & Watertight

Series 04 Miniature 22.5 mm (7/8") Oil Tight, two and three position keylock switches

FEATURES

- 600 VAC/10A, 220 VDC/0.5 A, 24 VDC/10 A
- Minimum depth: 2.01"
- Meets IP 65 and NEMA 4 and 13 specifications
- Emergency mushroom keylock
- Round or square bezel
- Momentary or maintained action
- Multiple key codes available



Series 04
Square keylock

Reference

International Approvals	page 3
Accessories	page 82
Technical Specifications	page 104

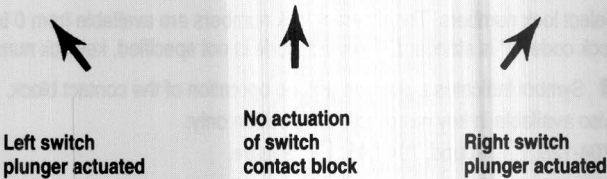
To order: select keylock actuator including positions, key removable positions, bezel style, and lock numbers. Then select up to four contact blocks specifying type of block, contact material, and contact configuration.

Flush mount adapter for keylocks:

See page 26 for Series 04 flush mount adapter. The 2-piece brushed aluminum adapter mounts in a standard 30.5 mm hole and maintains the front panel NEMA 4 & 13 and IP 65 sealing.

Operation of Keylock Actuator and Switch Contact Block

Two or three position keylock actuators have a single cam that actuates the contact block plungers as shown below. (Note that contact blocks can be reversed 180° — be sure that N.O. or N.C. contacts are in the proper location.)



Two and Three Position Keylock Actuators

Includes mounting flange. Contact block must be ordered separately, see next page.

		Key Operation*		Bezel Style	Part Number
2 positions 45°			momentary		704-123. <input type="checkbox"/> 704-343. <input type="checkbox"/>
2 positions 90°			maintained Key Removable		704-120. <input type="checkbox"/> 704-340. <input type="checkbox"/>
2 positions 90°		Key Removable	maintained		704-121. <input type="checkbox"/> 704-341. <input type="checkbox"/>
2 positions 90°		Key Removable	maintained Key Removable		704-122. <input type="checkbox"/> 704-342. <input type="checkbox"/>

(Cont. next page)

Keylock Switches — Oil & Watertight

3 positions 90°		maintained Key Removable	Key Removable	maintained Key Removable		704-113. <input type="checkbox"/> 704-333. <input type="checkbox"/>
3 positions 45°		maintained	Key Removable	maintained		704-114. <input type="checkbox"/> 704-334. <input type="checkbox"/>
3 positions 45°		momentary	Key Removable	momentary		704-115. <input type="checkbox"/> 704-335. <input type="checkbox"/>
3 positions 45°		maintained Key Removable	Key Removable	maintained Key Removable		704-116. <input type="checkbox"/> 704-336. <input type="checkbox"/>
3 positions 45°		maintained Key Removable	Key Removable	momentary		704-117. <input type="checkbox"/> 704-337. <input type="checkbox"/>
3 positions 45°		maintained Key Removable	Key Removable	momentary		704-124. <input type="checkbox"/> 704-344. <input type="checkbox"/>
3 positions 45°		momentary	Key Removable	maintained		704-118. <input type="checkbox"/> 704-338. <input type="checkbox"/>

☐ Select lock numbers. Ten different lock numbers are available from 0 to 9 (associated stamped keys 251-260)
Keylock code "0" is standard. If keylock code is not specified, keylock numbers will be supplied at random.

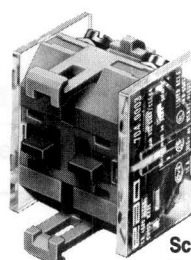
* Symbol indicates a position with no operation of the contact block.

** Also available in key removable left position only:
704-125. ☐ Round, 704-345. ☐ Square.

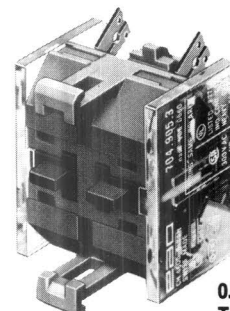
Contact Blocks

☐ Add digit for contact configuration

Up to four contact blocks may be connected to any one actuator



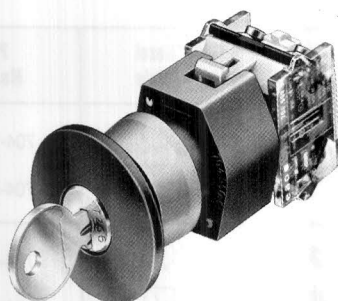
Screw
Terminals



0.250" Q.C.
Terminals

Emergency Keylock Actuator

Includes mounting flange but order contact blocks separately. To assure proper contact separation under all conditions, slow make/slow break contacts are recommended for emergency actuators



Maintained Action Key Release (To release, twist key clockwise)	Part Number
Gray plastic front ring, red plastic mushroom cap	704-076.0
Anodized aluminum ring, red plastic mushroom cap	704-078.0

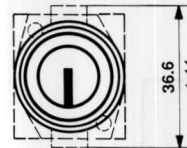
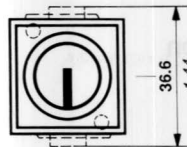
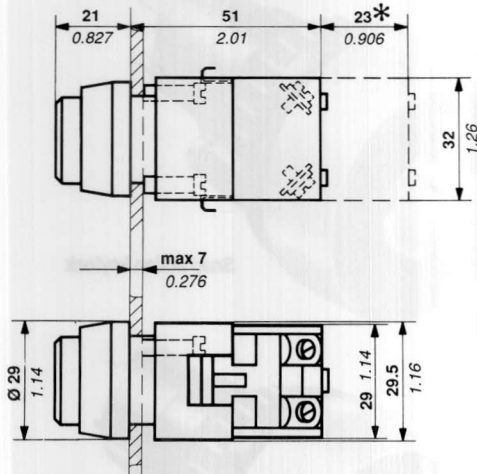
A "foolproof" emergency stop actuator with keylock release that meets VDE specifications is available on special order. Contact the factory.

Description	Part Number
Snap Action	
Hard silver contacts	704-900. <input type="checkbox"/>
Hard silver contacts, 0.250" Q.C. terminals	704-905. <input type="checkbox"/>
Gold/silver contacts	704-901. <input type="checkbox"/>
Silver/palladium contacts	704-902. <input type="checkbox"/>
Slow Make/Slow Break Action	
Hard silver contacts	704-910. <input type="checkbox"/>
Hard silver contacts, 0.250" Q.C. terminals	704-915. <input type="checkbox"/>
Gold/silver contacts	704-911. <input type="checkbox"/>
Silver/palladium contacts	704-912. <input type="checkbox"/>

☐ Contacts : 1 = 1 N.O., 2 = 1 N.C., 3 = 2 N.O., 4 = 2 N.C., 5 = 1 N.O., 1 N.C.

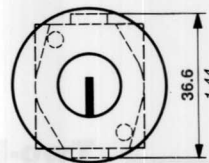
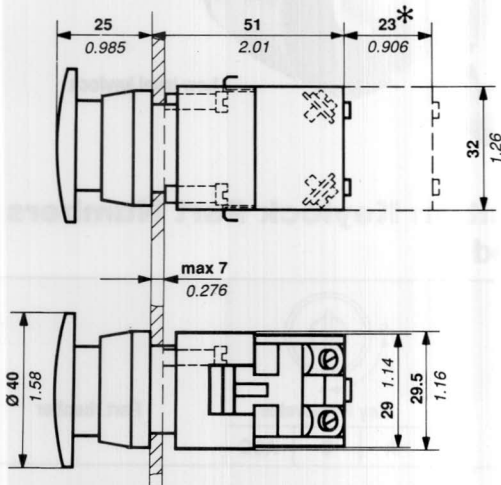
Keylock Switches — Oil & Watertight

Series 04 Dimensions & Mounting Information



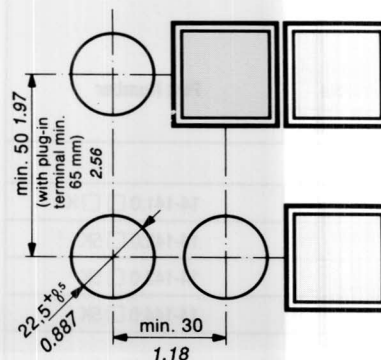
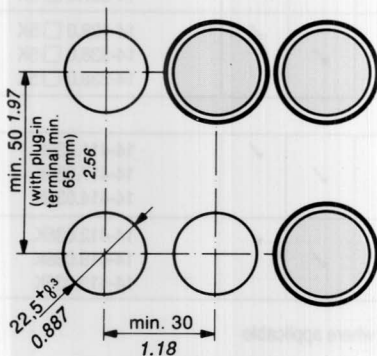
* For additional contact blocks add 23 mm (0.906 inches)

Keylock, round and square



* For additional contact blocks add 23 mm (0.906 inches)

Emergency mushroom keylock



Minimum 42 mm (1.65 inches) for emergency mushroom keylock

Keylock Switches — Oil & Watertight

Series 14

Two position miniature keylocks

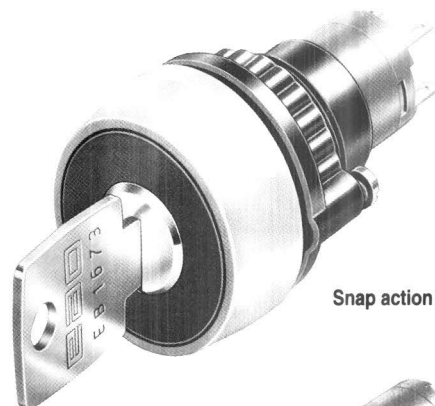
FEATURES

- 250 VAC/5A, 220 VDC/0.1 A, 24 VDC/2 A snap action
42 VAC/0.1 A, 42 VDC/0.1 A low level
- Minimum depth: 1.36"
- Mounts in 22.5 mm (7/8-inch) hole
- Meets IP 65 and NEMA 4 and 13 specifications
- Double sealed against oil and water

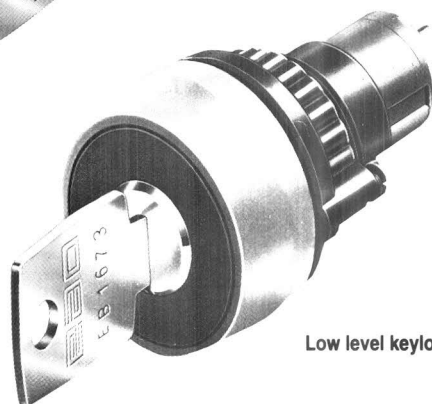
Reference

International Approvals	page 3
Accessories	page 82
Technical Specifications	page 104

To order: select keylock switch element and key removable positions (when applicable); also select contact material and termination.



Snap action keylock



Low level keylock

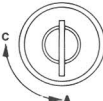
Keylock Type

Eight tumbler high security with flat key (K).

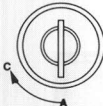
Suffix	Lock	Description
K	High Security	Eight tumbler lock mechanism uses a flat key. Two-position keylocks use key code 1001 as a standard stocking item. An additional 690 key codes may be requested. No master key is available. Spare key part number: 14-987. □ □ □ □ (Please specify 4 digit key code.)



Two-Position Keylock Part Numbers Maintained

Switch Element				Part Number
	Key Removable			
	A	C	A&C	
Snap Action				
1-pole Form Z	✓	✓	✓	14-135.0 <input type="checkbox"/> <input type="checkbox"/> K 14-335.0 <input type="checkbox"/> 5K 14-235.0 <input type="checkbox"/> 5K
2-pole Form Z	✓	✓	✓	14-136.0 <input type="checkbox"/> 5K 14-336.0 <input type="checkbox"/> 5K 14-236.0 <input type="checkbox"/> 5K
3-pole Form Z	✓	✓	✓	14-137.0 <input type="checkbox"/> 5K 14-337.0 <input type="checkbox"/> 5K 14-237.0 <input type="checkbox"/> 5K
4-pole Form Z	✓	✓	✓	14-138.0 <input type="checkbox"/> 5K 14-338.0 <input type="checkbox"/> 5K 14-238.0 <input type="checkbox"/> 5K
Low Level				
2 N.O. contacts	✓	✓	✓	14-411.036K 14-417.036K 14-414.036K
1 N.O., 1 N.C. contacts	✓	✓	✓	14-412.036K 14-418.036K 14-415.036K

Two-Position Keylock Part Numbers Momentary

Switch Element	 Key Removable			Part Number
	A	C	A&C	
	Snap Action			
1-pole Form Z	✓			14-141.0 <input type="checkbox"/> <input type="checkbox"/> K
2-pole Form Z	✓			14-142.0 <input type="checkbox"/> 5K
3-pole Form Z	✓			14-143.0 <input type="checkbox"/> 5K
4-pole Form Z	✓			14-144.0 <input type="checkbox"/> 5K
Low Level				
2 N.O. contacts	✓			14-437.036K
1 N.O., 1 N.C. contacts	✓			14-438.036K

Select contact and terminal type where applicable

.0 □ □

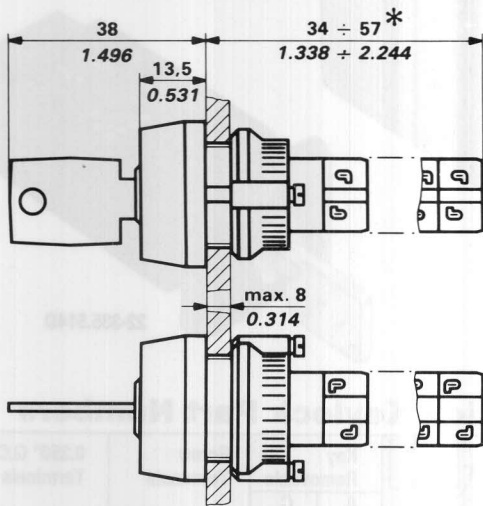
1st digit is always 0 (Case color is black)

Contact material (2nd digit): 1 = Silver, 2 = Gold over silver

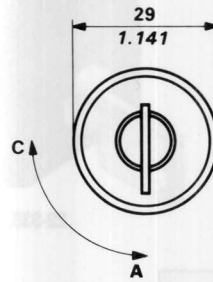
Terminal type (3rd digit): 2 = 0.110" Q.C., 5 = Solder

Keylock Switches — Oil & Watertight

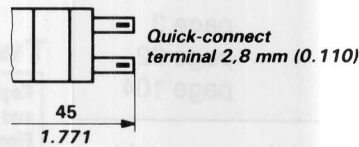
Series 14 Dimensions & Mounting Information



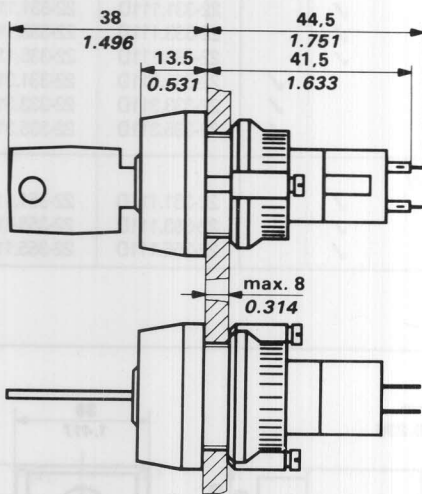
Snap Action Switch Element



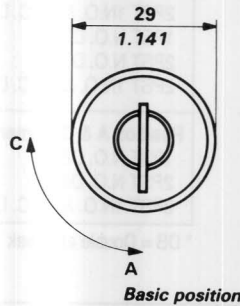
Basic position



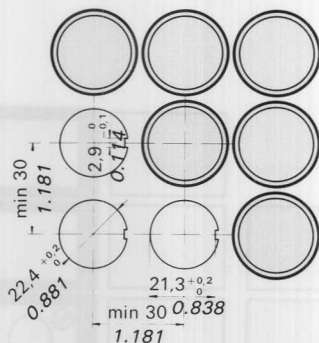
- *1 pole, 34.5 (1.36)
- 2 pole, 42 (1.65)
- 3 pole, 49.5 (1.95)
- 4 pole, 57 (2.24)



Low Level Switch Element

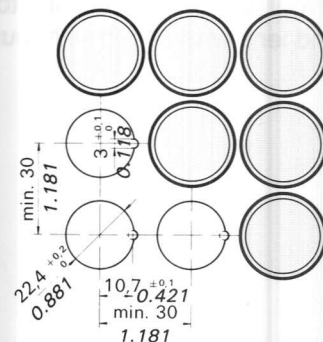


Basic position



To prevent rotation of keylocks

or
By using the accessory
anti-rotation insert (14-910)



With anti-rotation insert (14-910)

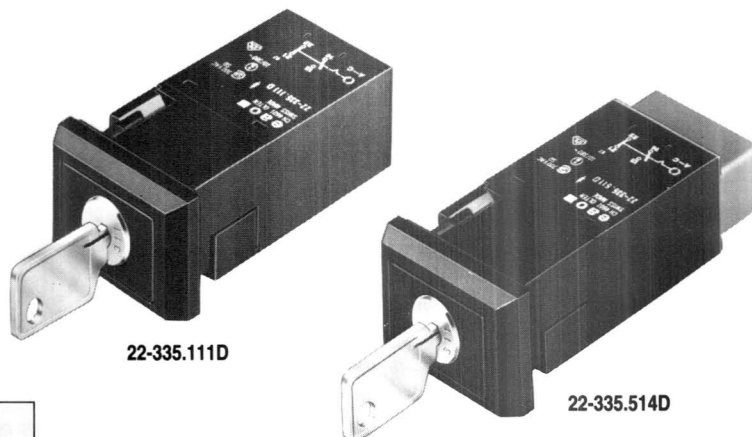
Keylock Switches — Oil & Watertight

Series 22

Two position keylocks

FEATURES

- 380 VAC/10 A, 220 VDC/0.2 A, 24 VDC/6 A
- Minimum depth: 2.34"
- Meets IP 65 and NEMA 4 and 13 specifications
- Double air break 3 mm contact gap
- Screw or quick connect terminals
- Mounts completely from front of panel



Reference

International Approvals	page 3
Accessories	page 82
Technical Specifications	page 104

To order: select keylock switch element, key removable positions, and termination.

Standard Keylock (suffix "D")

Five-tumbler lock mechanism with cut key. Key code 311 is the standard stocking item.

There are 134 other key codes available on request and a master key is available.

Two keys supplied with each keylock.

Spare key part number: 31/51-989. ☐ ☐ ☐

(Please state 3 digit key code)

Two Position Keylock Part Numbers

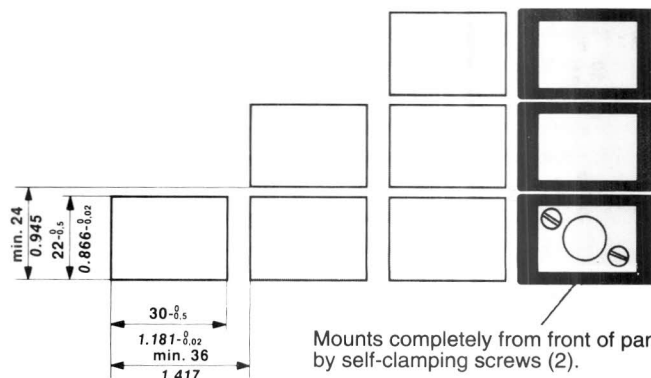
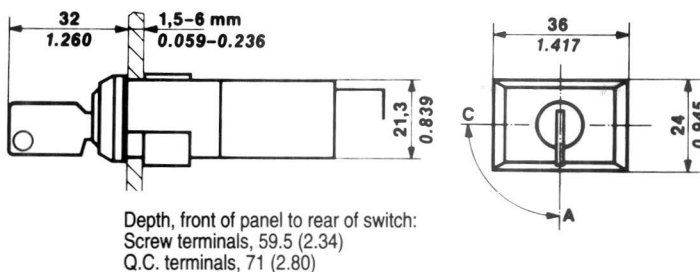
Keylock Function and Switch Element	Key Removable		Screw Terminals	0.250" Q.C. Terminals
	A	C		
Position A & C Maintained				
1PST N.O. DB*	✓	✓	22-331.511D	22-331.514D
2PST N.O. DB	✓	✓	22-333.511D	22-333.514D
2PST 1N.O. & 1N.C. DB	✓	✓	22-335.511D	22-335.514D
1PST N.O. DB	✓		22-331.111D	22-331.114D
2PST N.O. DB	✓		22-333.111D	22-333.114D
2PST 1N.O. & 1N.C. DB	✓		22-335.111D	22-335.114D
1PST N.O. DB		✓	22-331.311D	22-331.314D
2PST N.O. DB		✓	22-333.311D	22-333.314D
2PST 1N.O. & 1N.C. DB		✓	22-335.311D	22-335.314D
Position A & C Momentary				
1PST N.O. DB	✓		22-351.111D	22-351.114D
2PST N.O. DB	✓		22-353.111D	22-353.114D
2PST 1N.O. & 1N.C. DB	✓		22-355.111D	22-355.114D

* DB = Double air break

Dimensions & Mounting Information

Installation and removal of Series 22 pushbuttons, indicators, and keylocks

1. The lens (on pushbuttons and indicators) or faceplate (on keylocks) must be removed to operate the clamping screws located on the inside face of the switch.
2. Lens removal tool 02-905 can be used to remove pushbutton and indicator lens unless four-sided protection guard is installed.
3. Removal tool 98-968 can be used to remove keylock faceplate and lens when used with four-sided protection guard.



Mounts completely from front of panel by self-clamping screws (2).

Keylock Switches — Oil & Watertight

Series 31/51

Two and three position keylocks

FEATURES

- 250 VAC/5A, 220 VDC/0.1 A, 24 VDC/2 A snap action
42 VAC/0.1 A, 42 VDC/0.1 A low level
- Minimum depth: 1.00"
- Meets IP 65 and NEMA 4 and 13 specifications
- Miniature keylock switch
- Anti-static
- High security key available

Reference

International Approvals	page 3
Accessories	page 82
Technical Specifications	page 104

To order: select keylock switch element and key removable positions plus contact material, termination, and lock type, when applicable.

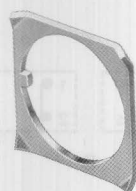
Notice to Series 31 and 51 Keylock users

Users of Series 31 or Series 51 keylocks now can obtain these switches under the combined part numbering prefix 31/51.

Series 51 keylock users will find absolutely no difference. Series 31 keylock users will find two additional features:

- Keylock is now oil and watertight.
- Keylock has improved anti-rotation feature.

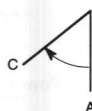
In addition, Series 31/51 keylocks are supplied with an anti-rotation locking washer which allows the switch to be mounted in round drilled holes. The anti-rotation washer prevents rotation when properly tightened.



51-910
Anti-rotation locking
washer supplied

Two-Position Keylock Part Numbers Momentary

Switch Element	Key Remove	Rectangular	Square	Round
Snap Action				
1-pole Form Z	A	31/51-495.02 □ □	31/51-145.02 □ □	31/51-141.02 □ □
2-pole Form Z	A	31/51-496.025 □	31/51-146.025 □	31/51-142.025 □
3-pole Form Z	A	31/51-497.025 □	31/51-147.025 □	31/51-143.025 □
4-pole Form Z	A	31/51-498.025 □	31/51-148.025 □	31/51-144.025 □
Low Level				
2 N.O. contacts	A	31/51-427.036 □	31/51-457.036 □	31/51-437.036 □
1 N.O., 1 N.C.	A	31/51-428.036 □	31/51-458.036 □	31/51-438.036 □



31/51-195.025K

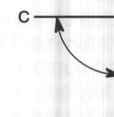


31/51-441.036K



31/51-135.025K

Two-Position Keylock Part Numbers Maintained



Switch Element	Key Remove	Rectangular	Square	Round
Snap Action				
1-pole Form Z	A & C	31/51-195.02 □ □	31/51-155.02 □ □	31/51-135.02 □ □
	A	31/51-295.02 □ □	31/51-255.02 □ □	31/51-235.02 □ □
	C	31/51-395.02 □ □	31/51-355.02 □ □	31/51-335.02 □ □
2-pole Form Z	A & C	31/51-196.025 □	31/51-156.025 □	31/51-136.025 □
	A	31/51-296.025 □	31/51-256.025 □	31/51-236.025 □
	C	31/51-396.025 □	31/51-356.025 □	31/51-336.025 □
3-pole Form Z	A & C	31/51-197.025 □	31/51-157.025 □	31/51-137.025 □
	A	31/51-297.025 □	31/51-257.025 □	31/51-237.025 □
	C	31/51-397.025 □	31/51-357.025 □	31/51-337.025 □
4-pole Form Z	A & C	31/51-198.025 □	31/51-158.025 □	31/51-138.025 □
	A	31/51-298.025 □	31/51-258.025 □	31/51-238.025 □
	C	31/51-398.025 □	31/51-358.025 □	31/51-338.025 □
Low Level				
2 N.O. contacts	A & C	31/51-401.036 □	31/51-441.036 □	31/51-411.036 □
	A	31/51-404.036 □	31/51-444.036 □	31/51-414.036 □
	C	31/51-407.036 □	31/51-447.036 □	31/51-417.036 □
1 N.O., 1 N.C.	A & C	31/51-402.036 □	31/51-442.036 □	31/51-412.036 □
	A	31/51-405.036 □	31/51-445.036 □	31/51-415.036 □
	C	31/51-408.036 □	31/51-448.036 □	31/51-418.036 □

Select terminal type and lock type digits where applicable
.02 □ □

1st digit is always 0 (Case color is black)

Contact material (2nd digit): 2 = Gold over silver

Note: Snap Action silver contacts are available on special request.

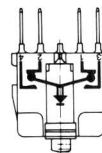
Terminal type (3rd digit): 2 = 0.110" Q.C., 5 = Solder

Lock type (4th digit): D = Standard lock, K = High security lock

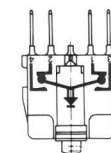
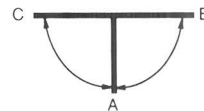
Keylock Switches — Oil & Watertight

Series 31/51 Operation

The Series 31/51 three-position keylock switch has two independent Form Z contact elements and each actuates depending on the key position. Please see illustration at right.



Switch #1



Switch #2

Position A — Does not actuate either switch #1 or #2

Position B — Actuates switch #1 only.

Position C — Actuates switch #2 only.

Three-Position Keylock Part Numbers

Includes switch contact block

☐ Add lock digit

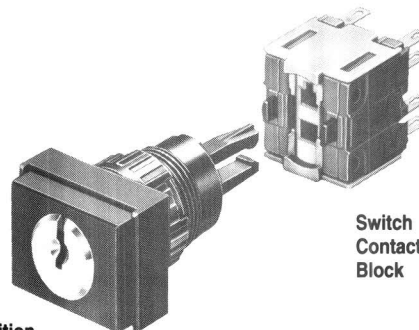
Function	Key Removable			Bezel			Fig.
	C	A	B	Rectangular	Square	Round	
Maintained C & B		✓		31/51-361.022 <input type="checkbox"/>	31/51-381.022 <input type="checkbox"/>	31/51-371.022 <input type="checkbox"/>	A
Maintained C & B	✓	✓	✓	31/51-362.022 <input type="checkbox"/>	31/51-382.022 <input type="checkbox"/>	31/51-372.022 <input type="checkbox"/>	A
Maintained C & B	✓		✓	31/51-363.022 <input type="checkbox"/>	31/51-383.022 <input type="checkbox"/>	31/51-373.022 <input type="checkbox"/>	A
Momentary C & B		✓		31/51-364.022D	31/51-384.022D	31/51-374.022D	B
Maintained C	✓	✓		31/51-366.022D	31/51-386.022D	31/51-376.022D	C
Momentary B		✓		31/51-365.022D	31/51-385.022D	31/51-375.022D	
Maintained B		✓		31/51-367.022D	31/51-387.022D	31/51-377.022D	C
Momentary C		✓	✓	31/51-368.022D	31/51-388.022D	31/51-378.022D	

☐ Lock Type: D = Standard lock, K = High security lock

Keylock Types

There is a choice of two keylock mechanisms: the standard five tumbler (D) or the eight tumbler high security (K). Adding the appropriate suffix letter to the part number defines the lock type. If no suffix number is indicated, the keylock switch will be supplied with the standard D-type lock. Two keys are supplied with each keylock.

Suffix	Lock	Description
D	Standard	Five tumbler lock mechanism with cut key. Key code 311 is the standard stocking item. There are 134 other key codes available on request and a master key is available. Spare key part number: 31/51-989. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> (Please state 3 digit key code)
K	High Security	Eight tumbler lock mechanism uses a flat key. Two-position keylocks use key code 1001 as a standard stocking item. An additional 690 key codes may be requested, and a master key is available. Three-position keylocks use key code 4001 as a standard stocking item. There are an additional 311 key codes available on request. No master key is available. Spare key part number: 14-987. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> (Please specify 4 digit key code.)

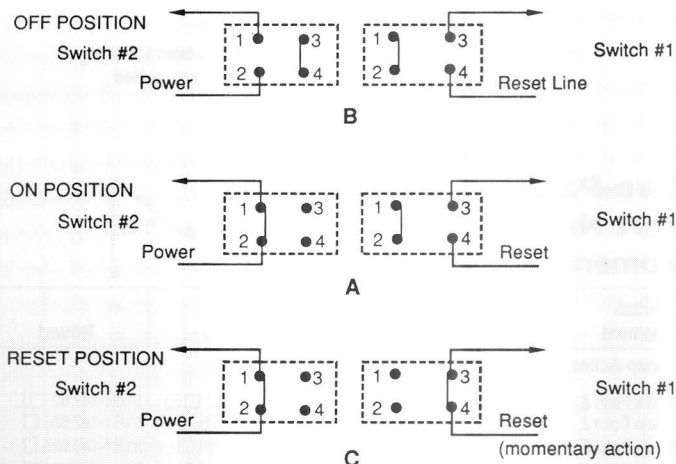
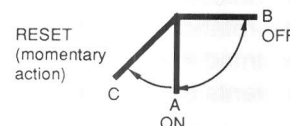


3-Position Keylock Actuator

Switch Contact Block

Application Note

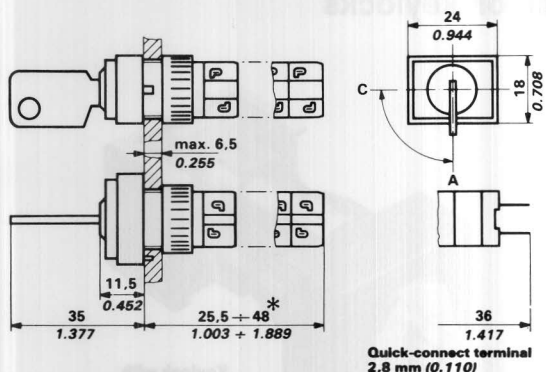
Two independently wired Form Z contacts actuated by different key positions.



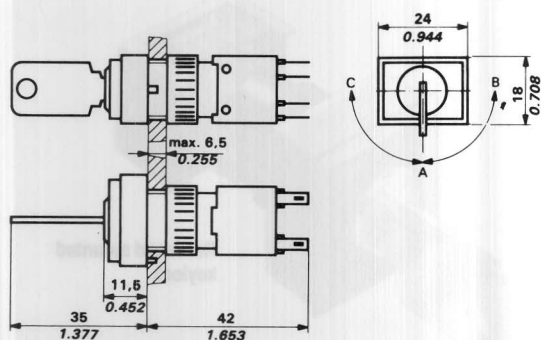
Leg A-B controls "Off-On." Leg A-C controls the momentary "Reset" without affecting the A-B circuit. Design is similar to a car ignition/start switch; the ignition coil remains on during actuation of the starter.

Keylock Switches — Oil & Watertight

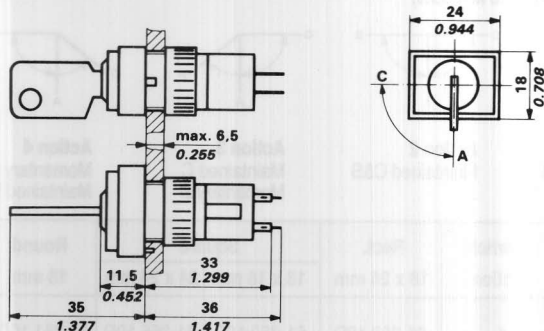
Series 31/51 Dimensions & Mounting Information



Two-Position Snap Action

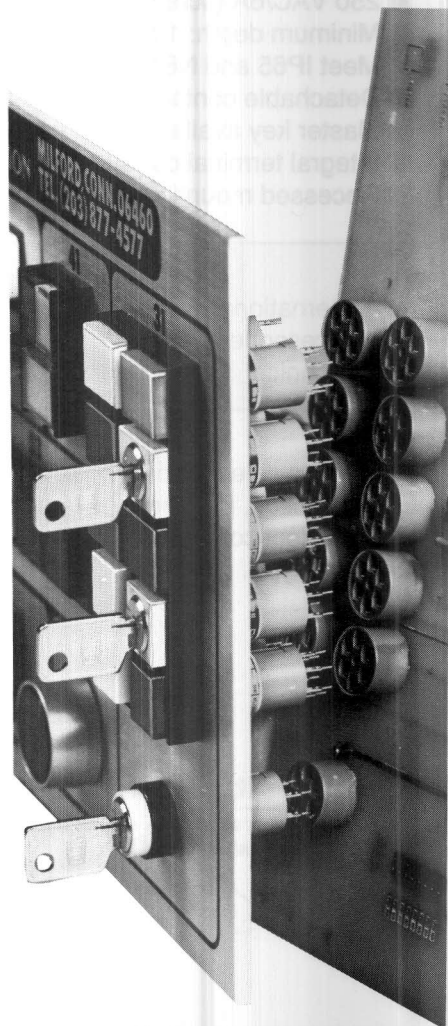


Three-Position Snap Action with Contact Block

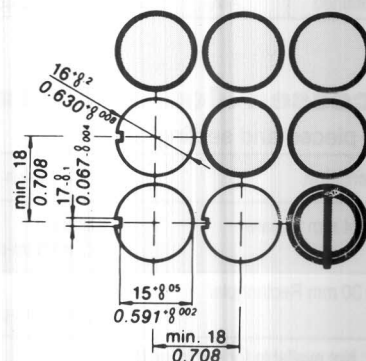
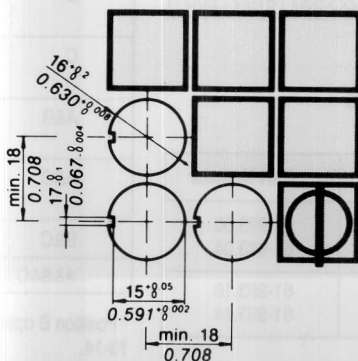
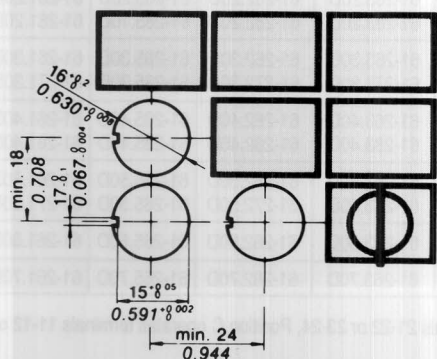


Two-Position Low Level

- * 1 pole, 25.5 (1.00)
- 2 pole, 33 (1.30)
- 3 pole, 40.5 (1.59)
- 4 pole, 48 (1.89)



Series 31/51 low level switches with mating connector mounted on a printed circuit board.



Round mounting hole may be used if anti-rotation locking washer (51-910) is installed to prevent rotation.

Keylock Switches — Oil & Watertight

Series 61

Subminiature Modular Oil & Watertight two and three position keylocks

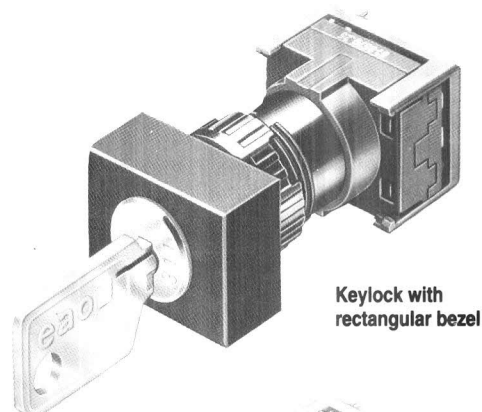
FEATURES

- 250 VAC/6A (screw term), 220 VDC/0.5 A, 24 VDC/2 A
- Minimum depth: 1.54"
- Meet IP65 and NEMA 4 and 13 specifications
- Detachable contact blocks, up to 3 poles
- Master key available
- Integral terminal cover on solder terminals
- Recessed mounting adapter available

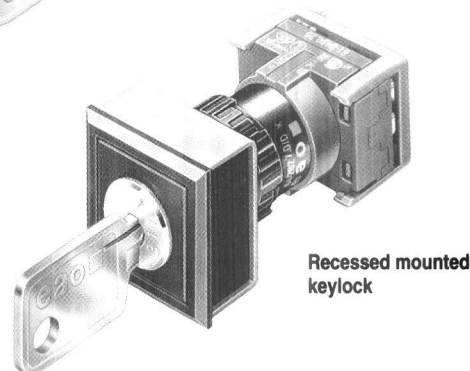
Reference

International Approvals	page 3
Accessories	page 82
Technical Specifications	page 104

To order: select 2- or 3-position keylock actuator, desired switch action, key removable positions, and bezel style. Then select contact block including contact material and terminal type.



Keylock with rectangular bezel



Recessed mounted keylock

Two-Position Keylock Actuators

(Order contact block separately. Recessed mounting adapter available for rectangular and 18 x 18 mm square keylocks)



Momentary



Maintained

Switch Action	Key Removable	Rect. 18 x 24 mm	Square		Round 18 mm
			18 x 18 mm	24 x 24 mm	
Momentary	A	61-213.10D	61-212.10D	61-215.10D	61-211.10D
Maintained	A	61-223.10D	61-222.10D	61-225.10D	61-221.10D
Maintained	C	61-223.30D	61-222.30D	61-225.30D	61-221.30D
Maintained	A&C	61-223.50D	61-222.50D	61-225.50D	61-221.50D

Recessed Mounting Adapters

(Two pieces and sealing gasket)

Description	Finish	Part Number
24 x 24 mm Square	Black Chromium-plated	61-993.00 61-993.04
24 x 30 mm Rectangular	Black chromium-plated	61-993.10 61-993.14

NOTE: Not available for round keylocks.

Three Position Keylock Actuators*

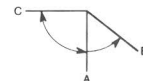
(Order contact block separately. Recessed mounting adapter available for rectangular and 18 x 18 mm square keylocks)



Action 1
Momentary C&B



Action 2
Maintained C&B



Action 3
Maintained C
Momentary B



Action 4
Momentary C
Maintained B

Key Removable	Switch Action	Rect. 18 x 24 mm	Square		Round 18 mm
			18 x 18 mm	24 x 24 mm	
A	1	61-253.10D	61-252.10D	61-255.10D	61-251.10D
	2	61-263.10D	61-262.10D	61-265.10D	61-261.10D
	3	61-273.10D	61-272.10D	61-275.10D	61-271.10D
	4	61-283.10D	61-282.10D	61-285.10D	61-281.10D
B	2	61-263.20D	61-262.20D	61-265.20D	61-261.20D
	4	61-283.20D	61-282.20D	61-285.10D	61-281.20D
C	2	61-263.30D	61-262.30D	61-265.30D	61-261.30D
	3	61-273.30D	61-272.30D	61-285.30D	61-271.30D
A&B	2	61-263.40D	61-262.40D	61-265.40D	61-261.40D
	4	61-283.40D	61-282.40D	61-285.40D	61-281.40D
A&C	2	61-263.50D	61-262.50D	61-265.50D	61-261.50D
	3	61-273.50D	61-272.50D	61-285.50D	61-271.50D
B&C	2	61-263.60D	61-262.60D	61-265.60D	61-261.60D
	2	61-263.70D	61-262.70D	61-265.70D	61-261.70D

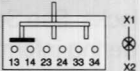
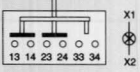
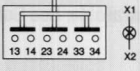
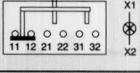
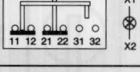
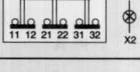
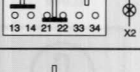
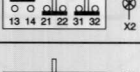
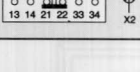
* Position B operates terminals 21-22 or 23-24, Position C operates terminals 11-12 or 13-14.

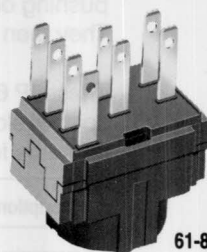
Keylock Switches — Oil & Watertight

Series 61 Contact Blocks for 2-Position Keylock Switches

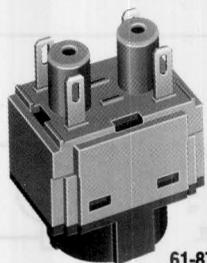
Snap-action

(Select contact and terminal type)

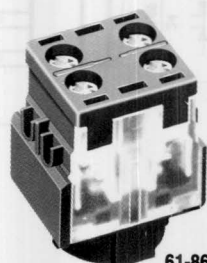
Description	Contacts	Part Number
1PST, N.O.	 X1 X2	61-841.0 □ 2
2PST, N.O.	 X1 X2	61-842.0 □ 2
3PST, N.O.	 X1 X2	61-843.0 □ 2
1PST, 1 N.C.	 X1 X2	61-844.0 □ 2
2PST, 2 N.C.	 X1 X2	61-845.0 □ 2
3PST, 3 N.C.	 X1 X2	61-846.0 □ 2
2PST, N.O./N.C.	 X1 X2	61-847.0 □ 2
3PST, N.O./2 N.C.	 X1 X2	61-848.0 □ 2
3PST, 2 N.O./N.C.	 X1 X2	61-849.0 □ 2



61-843.022



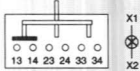
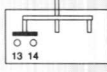
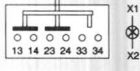
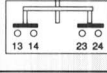
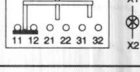
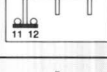
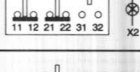
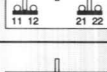
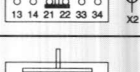
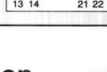
61-875.517



61-865.511

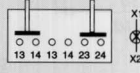
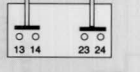

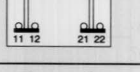
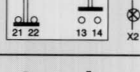
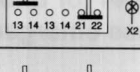
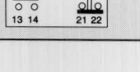
Slow-Make

(Select contact and terminal type)

Description	Contacts	Part Number
1PST, N.O.	 X1 X2	61-861.0 □ □
1PST, N.O.	 X1 X2	61-861.511
2PST, N.O.	 X1 X2	61-862.0 □ 7
2PST, N.O.	 X1 X2	61-862.511
1PST, 1 N.C.	 X1 X2	61-864.0 □ □
1PST, 1 N.C.	 X1 X2	61-864.511
2PST, 2 N.C.	 X1 X2	61-865.0 □ 7
2PST, 2 N.C.	 X1 X2	61-865.511
2PST, N.O./N.C.	 X1 X2	61-867.0 □ 7
2PST, N.O./N.C.	 X1 X2	61-867.511

Contact Blocks for 3-Position

(Select contact and terminal type where applicable)

Description	Contacts	Part Number
2PST, 2 N.O. Snap-action Slow-make	 X1 X2	61-852.0 □ □ 61-872.0 □ 7
2PST, 2 N.O. Slow-make	 X1 X2	61-872.511
2PST, 2 N.C. Snap-action Slow-make	 X1 X2	61-855.0 □ □ 61-875.0 □ 7
2PST, 2 N.C. Slow-make	 X1 X2	61-875.511
2PST, N.C./N.O. Snap-action	 X1 X2	61-857.0 □ □
2PST, N.O./N.C. Snap-action Slow-make	 X1 X2	61-857.4 □ □ 67.877.0 □ 7
2PST, N.O./N.C. Slow-make	 X1 X2	61-877.511

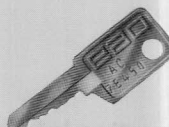
Contact and Terminal Selection

□ □ Select contact and terminal type where applicable

Contact material (2nd digit): 1 = Silver, 2 = Gold over silver (snap-action only), 3 = Gold* (slow-make only). Terminal type (3rd digit): 1 = Screw (slow-make and silver contact only), 2 = 0.110" Q.C. plug-in or solder (snap-action only), 7 = 0.110" Q.C. or solder (slow-make only)

* Low level to 42 V AC/100 mA

Keylock Types

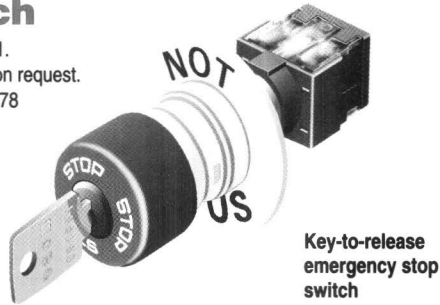


The standard five tumbler D-type lock mechanism with cut key is available. Two keys are supplied with each keylock. Key code 311 is the standard stocking item. There are 134 other key codes available on request. A master key is available. Spare key part number: 31-989. □ □ □. (State 3 digit key code)

Keylock Switches — Oil & Watertight

Series 61 Emergency Keylock Stop Switch

Standard key code is 1001.
Other numbers available on request.
Spare keys: Part No. 14-978
(state 4-digit key code)



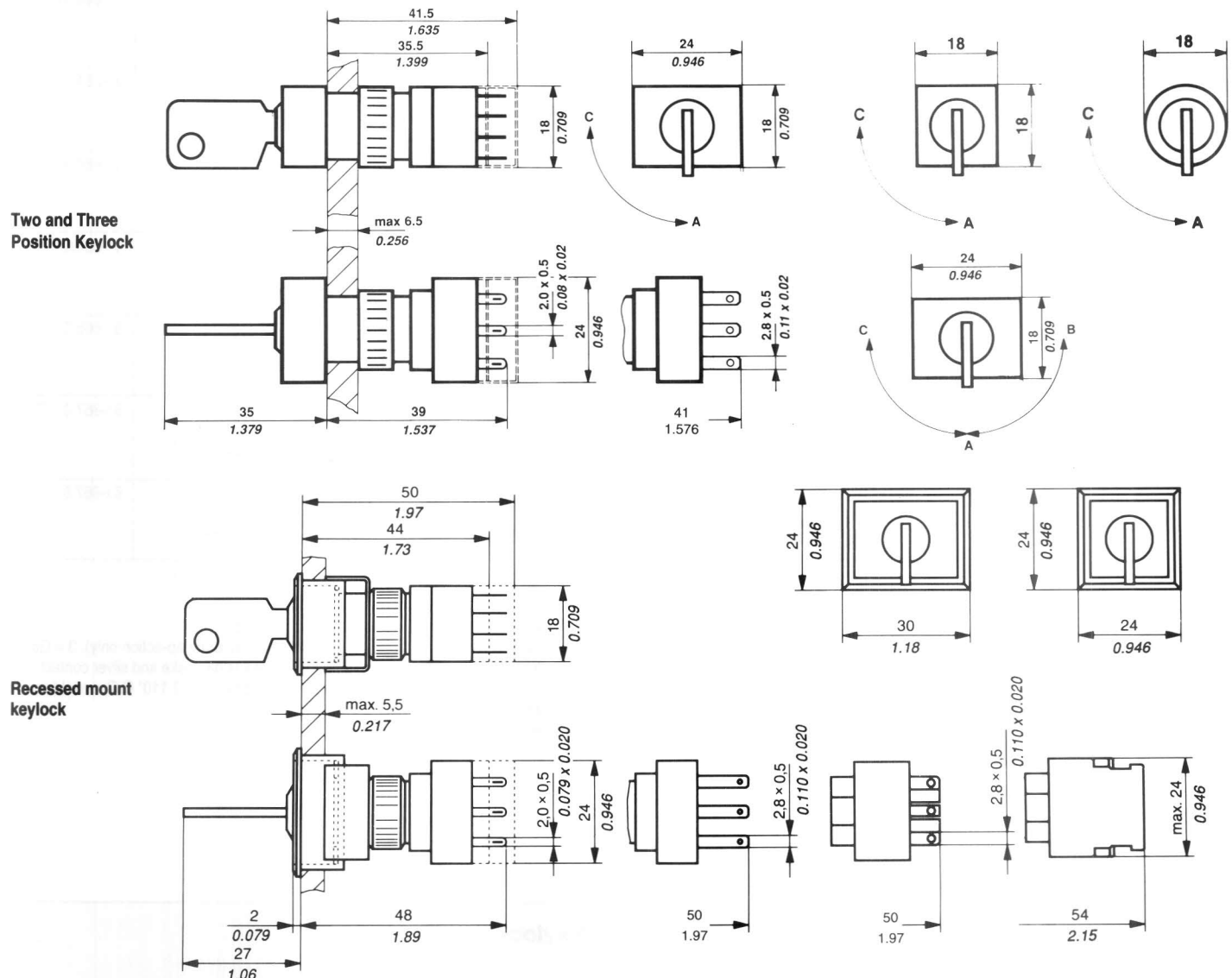
Emergency keylock stop switches are operated by simply pushing on the front operator to immediately break a circuit. They then may be released to reactivate the circuit using a key.

These IP 65 (NEMA 4 & 13) sealed emergency stop units use special slow-make contact blocks. See Series 61 pushbutton switches for contact block ordering information.

Description	Part Number
Emergency keylock stop actuator	61-544.14K

Yellow "Emergency Stop" identity plate available. See Series 61 Pushbutton Section

Dimensions & Mounting Information



See Series 61 pushbuttons for mounting information

Keylocks

To prevent rotation, punching tool (Part no. 51-999) produces an anti-rotation projection in the mounting hole.

Anti-rotation locking washer (Part no. 51-910) also is available.

**See page 44 for dimensions of Series 61
key-release emergency stop switch**

Keylock Switches — Push-to-Operate & Emergency

Series 02/03

Push-to-Operate & Emergency

FEATURES

- 380 VAC/10A, 220 VDC/0.2 A, 24 VDC/6 A
- Minimum depth: 2.95"
- Unique push-to-operate keylock operation
- Protection guards available

Reference

International Approvals	page 3
Accessories	page 82
Technical Specifications	page 104

To order: select push-to-operate or emergency keylock action, and pushbutton or mushroom cap where applicable.

Keylock Switch Operation

Position "C" is the unlocked position and the pushbutton acts as a momentary switch. In position "A" the pushbutton can be locked in the actuated or unactuated position, or both, depending on choice of keylock operation.

Keylock Codes

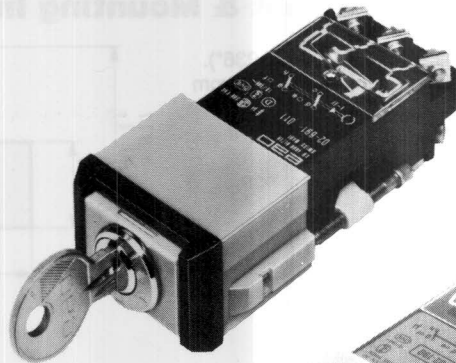
There are 10 keylock codes. Keylock code 1 is the standard stocking item. Other key codes upon request. No master key. Two keys are supplied with each keylock.

Push-to-Operate Keylock Part Numbers

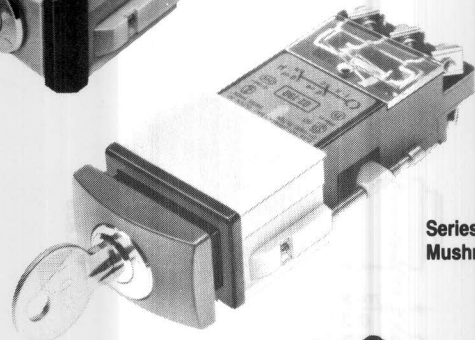
Function Key removable in position A (A is the locking position)	Series 02	Series 03
2PDT contacts Locks in actuated position.	02-690.011	03-690.011
2PDT contacts Locks in unactuated position.	02-691.011	03-691.011
2PDT contacts Locks in actuated or unactuated position.	02-692.011	03-692.011
2PDT contacts Locks in unactuated position. Locks in actuated position but key not removable.	02-695.011	03-695.011

Protection guards are available in the Accessory section of this catalog. To install protection guards, existing flat bezel must be removed and protection guard inserted in its place.

Series 02 Two-sided
Raised Protection Guard



Series 02
Mushroom Cap



Series 03 Four-sided
Raised Protection Guard



Emergency Keylock Part Numbers

Push mushroom or pushbutton to lock-off

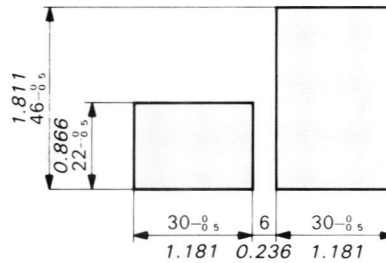
Function Key removable in position A (A is the locking position)	Series 02	Series 03
2PDT contacts. Pushbutton Operator. May be actuated without key by depressing pushbutton. Key is needed to deactivate.	02-198.011	03-198.011
2PDT contacts. Red Mushroom Cap. May be actuated without key by depressing cap. Key is needed to deactivate.	02-199.011	03-199.011

Keylock Switches — Push-to-Operate & Emergency

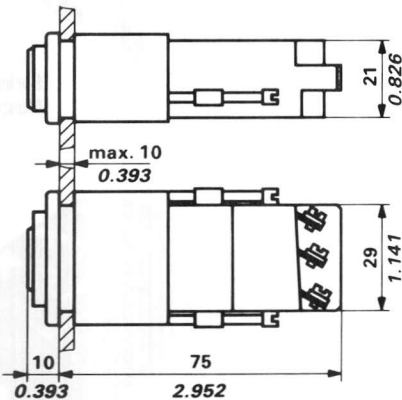
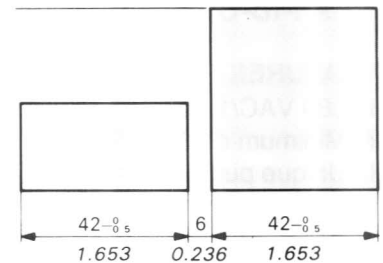
Series 02/03 Dimensions & Mounting Information

Vertical spacing between cutouts is 6 mm (0.236").
For two pole switches, a horizontal spacing of 4 mm (0.158") must be maintained or a terminal cover must be used if spacing is less. Not necessary if voltage is low.
A panel punching tool may be supplied on loan.

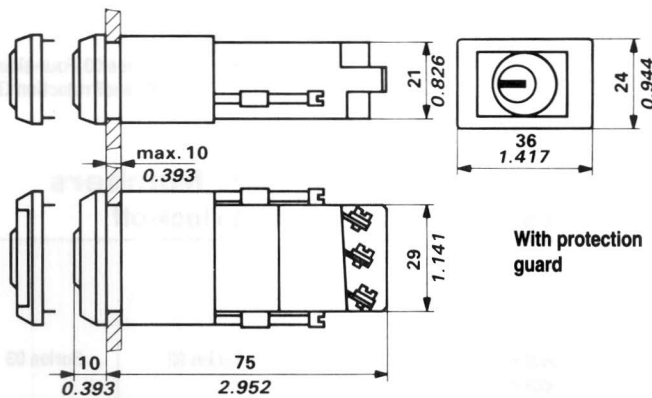
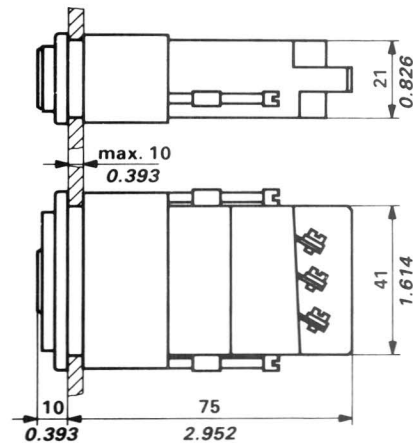
Series 02



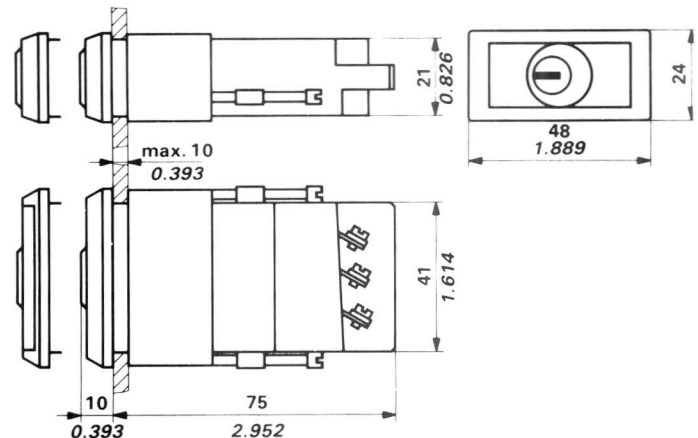
Series 03



Flat bezel

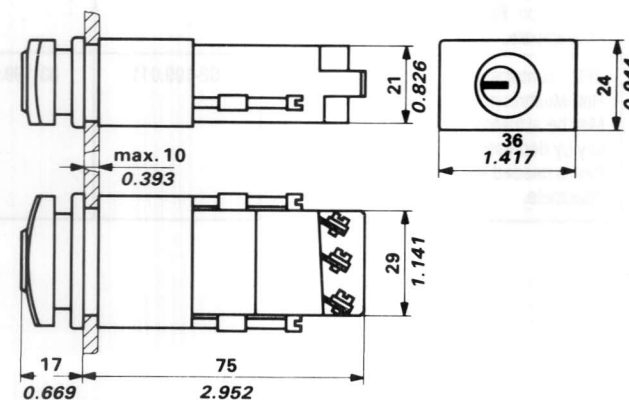


With protection guard

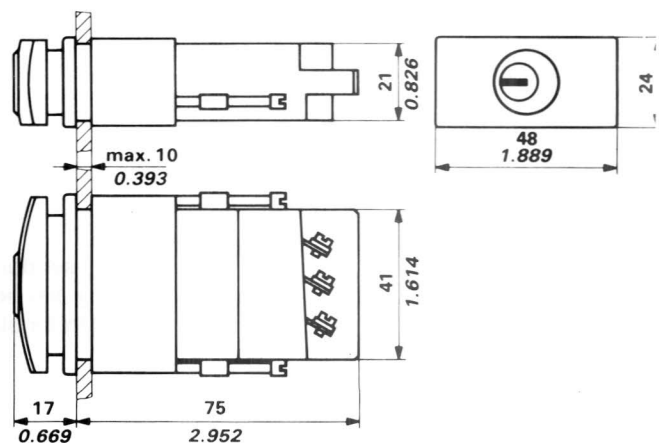


Series 02 Push-to-Operate Keylocks

Series 03 Push-to-Operate Keylocks



Series 02 Mushroom Cap Keylocks



Series 03 Mushroom Cap Keylocks

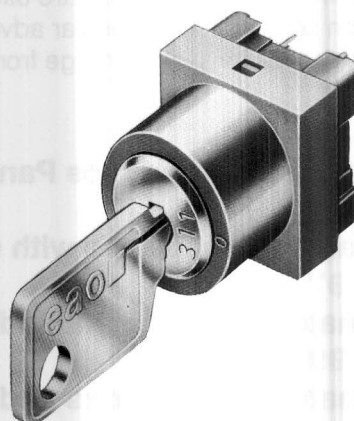
Keylock Switches — Printed Circuit Board

Series 99

Two and three position maintained keylocks

FEATURES

- 42 VAC/0.1 A, 42 VDC/0.1 A
- Minimum depth: 0.5"
- Mount directly on circuit board for flow soldering, washable if vinyl cover is used
- Anti-static
- Two and three-position available
- Gold contacts



Reference

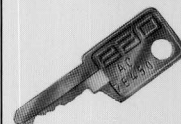
International Approvals	page 3
Accessories	page 82
Technical Specifications	page 104

To order: select 2- or 3-position keylock switch element and key removable positions.

Keylock Type

Standard lock (Type D). Two keys are supplied with each keylock.

Suffix	Lock	Description
D	Standard	Five tumbler lock mechanism with cut key. Key code 311 is the standard stocking item. There are 134 other key codes available on request and a master key is available. Supplied with two keys. Spare key part number: 31-989. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> (Please state 3 digit key code)



Technical Information

Anti-static	10 KV per IEC65
Mechanical life (keylock mechanism)	50,000 operations
Keylock operate force	4.7 - 6.0 Ncm (0.035 ft-lbs)
Environment protection	IP40

Dimensions & Mounting Information

Two Position Keylock Part Numbers

Key Function	Key Removable in Position	Part Number
1 N.O. (Pins 1-2)	A C A & C	99-210.837D 99-230.837D 99-250.837D
2 N.O. (Pins 1-2, 3-4)	A C A & C	99-211.837D 99-231.837D 99-251.837D
1 N.O. (Pins 1-2), 1 N.C. (Pins 3-4)	A C A & C	99-213.837D 99-233.837D 99-253.837D

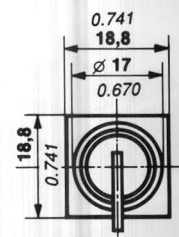
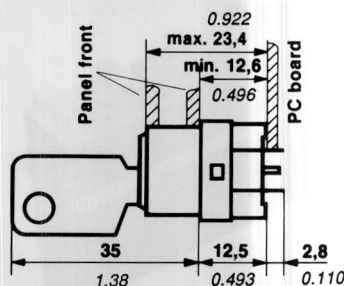
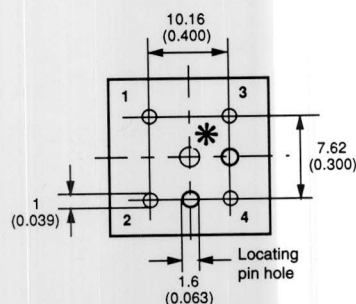
Three Position Keylock Part Numbers

Key Function	Key Removable in Position	Part Number
2 N.O. (Pins 1-2, 3-4)	A B C	99-311.837D 99-321.837D 99-331.837D
Operation: Position A — no contacts are actuated Position B — closes pins 1-2 Position C — closes pins 3-4	A & B A & C B & C A & B & C	99-341.837D 99-351.837D 99-361.837D 99-371.837D

PC Board Dimensions

(Bottom view)

* 1.6 mm (0.063) diameter hole is required if a M 1.2 screw (Part No. 99-990) is used to secure.

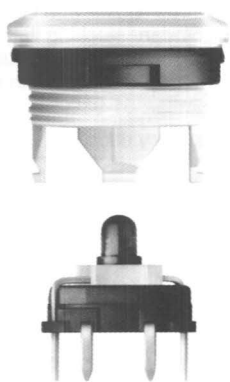


Typical panel cutout

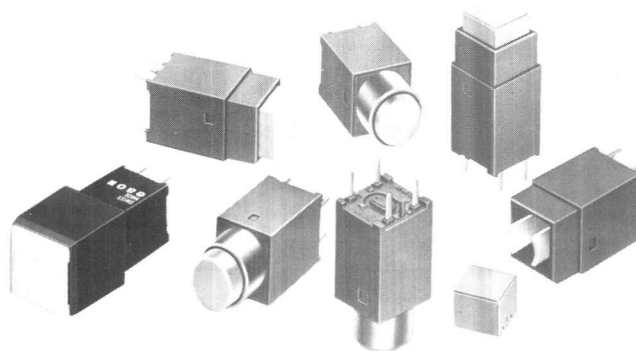
Printed Circuit Board Switches

EAO printed circuit board switches are used wherever attractive, dependable switching of low-level circuits is required. Each series offers particular advantages for PCB mounting and the variety of styles assures easy selection for particular applications. Units range from washable illuminated pushbuttons to components for membrane arrays.

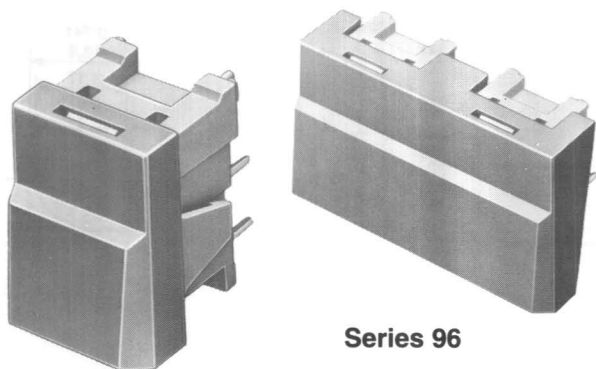
■ Series 92	
Discrete Membrane-type Panel-Mounted Switches	65
■ Series 96	
Washable Pushbuttons with One or Two LEDs	69
■ Series 97	
Illuminated Switches and Indicators	72
■ Series 99	
Illuminated Pushbuttons and Indicators	74



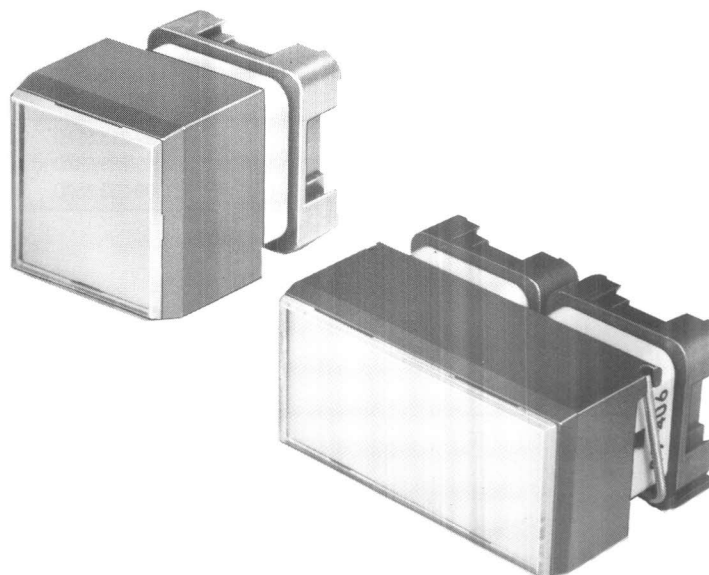
Series 92



Series 97



Series 96



Series 99

Printed Circuit Board Switches

Series 92

Panel-mounted PCB Pushbutton Switches and Indicators

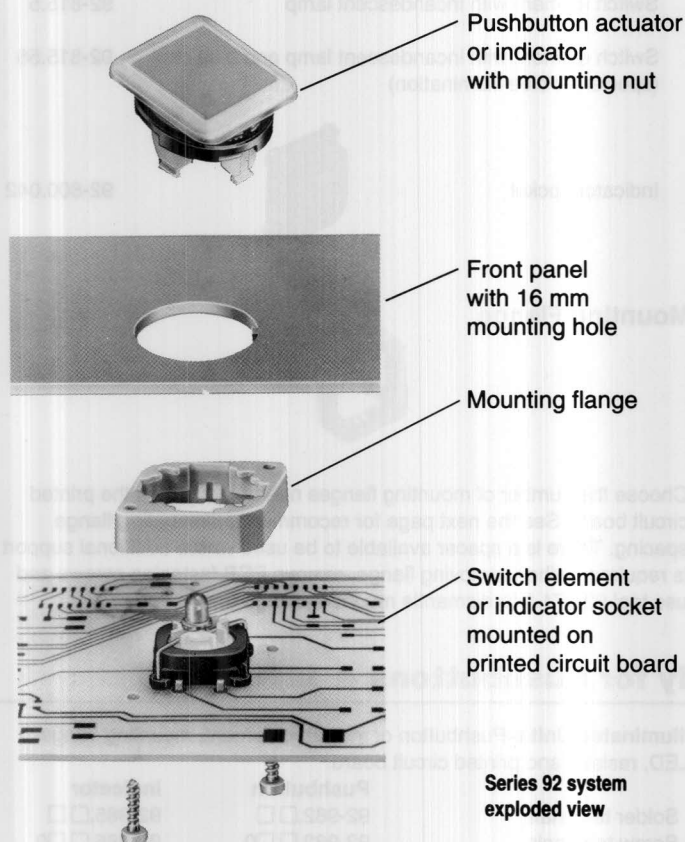
FEATURES

- SPST contacts rated at 42 V, 50 mA
- More than 1,000,000 operations
- Replace complex membrane switch systems
- Standard (IP 40) and sealed (IP 67) actuators
- Excellent tactile feel
- Actuators mount in standard 16 mm front panel hole
- LED in single or multi-chip and bi-color

Reference

Series 70 membrane switch elements	page 78
Accessories	page 82
Lamps	page 94
Legends	page 100
Technical Specifications	page 104

To order: See ordering procedure on next page.



Series 92 membrane switch system components assemble quickly and easily. The actuator and switch element install independently of each other and are designed to provide a constant back-of-panel depth. A keyed mounting hole assures switch and legend orientation. Each part snaps together firmly for a secure connection between panel and PCB.

Standard Actuator (IP 40, similar to NEMA 5)

Series 92 standard actuators are dependable, brightly lighted, general purpose, flush-mount switches. They are used in non-critical environmental conditions where IP 40 protection is adequate.

Sealed actuator (IP 67, similar to NEMA 4 and 13)

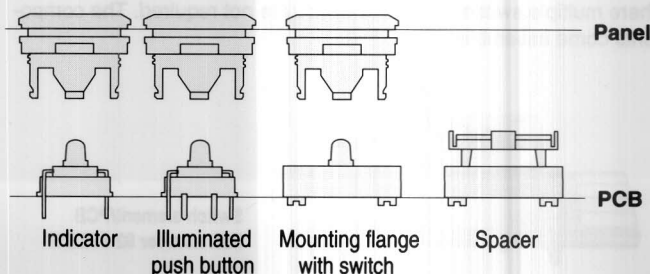
Series 92 sealed actuators are used whenever an attractive, flush-mount, sealed switch is needed. They find particular application in hostile environments where rugged dependability is important. Typical applications include instrumentation, industrial equipment, security devices, and food service equipment. Sealed units can often be used in place of expensive, complex membrane switch systems

Interchangeability with Series 84 components

Series 92 actuators can be used with Series 84 switching elements (See page 45A). Also, award-winning Series 84 flush mount pushbutton actuators are designed to be used with Series 92 PCB mounted switch elements.

Mounting the Series 92

1. Pushbutton actuators and indicators with flat, sealed (IP 67) membrane-type lenses or with standard (IP 40) lenses fit in a 16 mm hole and are secured to the front panel with a mounting nut.
 2. The switch elements are installed on the printed circuit board according to the PC board layout shown on page 68.
 3. Mounting flanges are attached to the PCB with two screws and are only used where needed for support. The mounting array shown on page 68 indicates the suggested placement of flanges.
 4. The actuators simply snap into the mounting flanges to assure a secure connection between panel and PCB. The actuator geometry determines that a constant 12 mm (0.473 in.) space is maintained between the front of the panel and the printed circuit board. This distance is maintained with or without the mounting flange.
- If only a few switches are to be mounted on a large PCB, a spacer is available to provide additional support.



Printed Circuit Board Switches

Series 92 Ordering Procedure

First order actuator or indicator from table below indicating lens color and legend requirements, if any. Then select switch element or indicator socket, LED, and mounting flange separately.

Series 92 Actuators & Indicators

Order mounting flange, switch element or indicator socket, and LED separately

Description	Actuator Case Color		Panel Protection	
	White	Black	Standard (IP 40)	Sealed (IP 67)
Non-Illuminated Pushbutton	✓	✓	92-356. □□ 92-456. □□	92-351. □'00* —
Illuminated Pushbutton	✓	✓	92-358. □□ 92-458. □□	92-353. □□ 92-453. □□
Indicator	✓	✓	92-058. □□ 92-158. □□	92-053. □□ 92-153. □□

* Uses opaque colored membrane caps

□¹ Lens colors

Version	0*	1	2	3	4	5	6	7	8*	9
Standard (IP 40)	✓*	✓	✓	✓	✓	✓	✓	✓	✓*	✓*
Sealed (IP 67)	✓*	—	✓	✓	✓	✓	✓	—	✓*	✓

0 = Black, 1 = Smoke, 2 = Red, 3 = Orange, 4 = Yellow, 5 = Green, 6 = Blue, 7 = Clear, 8 = Gray, 9 = White. * Opaque, do not use for lighted applications.

□² Legend Requirements

00 = No legend

99 = Legend required. Supply your requirements. See p. 102

LED (If illuminated) T-1, Bi-Pin

Single chip, 2.2 V/20 mA



92-948.□

Multi-chip, 12 V/20 mA



92-945.□

Bi-color, Red/Green, 12 V/20 mA (with external resistor) 92-945.2/5

□ Select color: 2=Red, 3 = Orange, 4 = Yellow, 5 = Green

Incandescent Lamp (If illuminated)

For special requirements demanding strong or blue illumination. Use with switch element designed for incandescent lamp.

Incandescent lamp, 24 VDC/20 mA

92-946.30

Incandescent lamp with blue cap, 24 VDC/20 mA

92-946.36

Standard (IP 40) Version

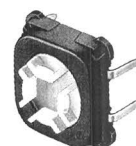
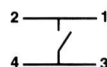
1. Actuator case in black or white.
2. Colored lens in transparent or translucent style. Translucent not recommended for illumination. (92-356. □□ and 92-456. □□)

Sealed (IP 67) Version

1. Actuator case in black or white. If opaque membrane is used, it covers bezel, and actuator case color is not seen.
2. Clear membrane for illumination; opaque membrane for non illuminated applications.
3. Colored translucent legend plates.
4. For non-illuminated unit with legend, order illuminated unit without LED

Switch Element or Indicator Socket

Switch element for LED



92-851.342

Switch element with incandescent lamp

92-815.5

Switch element with incandescent lamp and blue cap (special for blue illumination)

92-815.56

Indicator socket



92-800.042

Mounting Flange

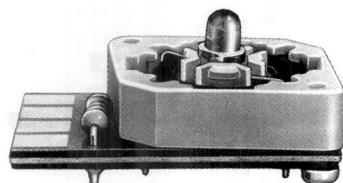


92-960.0

Choose the number of mounting flanges needed to secure the printed circuit board. See the next page for recommended mounting flange spacing. There is a spacer available to be used where additional support is required. When removing flange, remove PCB fastening screws and use tool 92-971.0 to dismantle mounting flange from actuator.

Assembled Printed Circuit Board Assembly for Pushbuttons & Indicators

These units provide a single switch (with or without LED illumination) or an indicator on a 0.688 x 1.068 inch printed circuit board for applications where multiple switches on a PC board are not required. The components come assembled.



Switch element/PCB
Part number 92-982.21

Illuminated Units: Pushbutton or indicator element, mounting flange, LED, resistor and printed circuit board.

	Pushbutton	Indicator
Solder terminals	92-982.□□	92-985.□□
Screw terminals	92-982.□□0	92-985.□□0

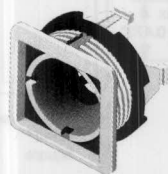
□□ Select LED color and voltage: 1st digit LED color: 2 = Red, 3 = Orange, 4 = Yellow, 5 = Green. 2nd digit voltage: 0 = 2.2 V, 1 = 5 V, 3 = 12 V, 6 = 24 V

Non-Illuminated Units: Pushbutton element, mounting flange, and printed circuit board.

Solder terminals	92-981.0
Screw terminals	92-981.001

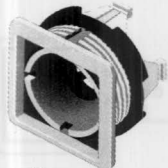
Printed Circuit Board Switches

Series 92 Component Parts



Indicator Housing (with mounting nut)
White
Black

92-050.00
92-150.00

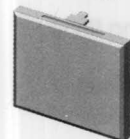


Actuator Housing (with mounting nut)
White
Black

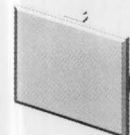
92-350.000
92-450.000



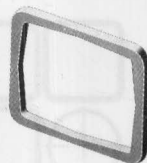
Membrane Cap for IP 67 Version
Clear for lighted pushbuttons and indicators 92-953.700



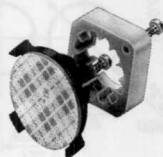
Lens for IP 40 Version (select color from table above)
Translucent 92-956.□00
Transparent 92-958.□00



Legend Plate for IP 67 Version (select color)
□ 2 = Red, 3 = Orange, 4 = Yellow,
5 = Green, 6 = Blue, 9 = White 92-951.□00



Bezel Shim
Bezel shim is located under the bezel only on IP 40 pushbuttons or indicators
Black 92-912.0
White 92-912.9



Spacer
Use when number of actuators is insufficient for PCB size.
Spacer adjusts to panel thicknesses of 1.5, 2.0, 2.5, 3.0, 3.5, and 4.0 mm 92-965.0



PC Board
To mount single pushbutton switch or indicator 92-989.0



Membrane Tool
To remove and replace membrane cap 92-998



Dismantling Tool
To remove actuator from mounting flange 92-971.0

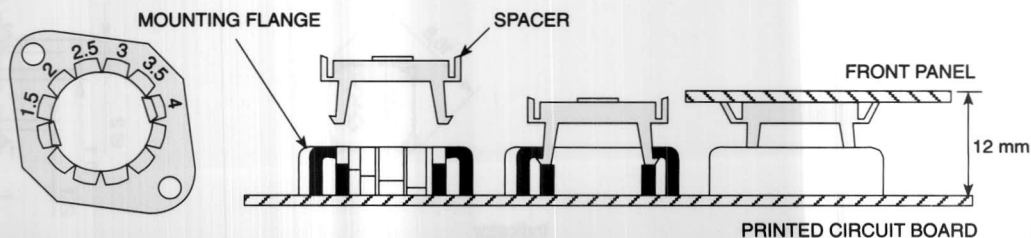
Series 92 PCB Support System

The EAO Series 92 switching system incorporates a unique technique for spacing and supporting the printed circuit board.

1. Pushbutton actuators and indicator housings attach to the front panel in a 16 mm hole.
2. Switch elements and/or indicator sockets solder to the PCB.
3. Mounting flanges are attached with two screws to the PCB and the entire assembly functions as a stand-off for support and spacing. See "Mounting Information" for suggested positioning of mounting flanges.
4. The PCB is supported and spaced from the panel front surface at a constant distance of 12 mm (0.473").
5. For areas on a large PCB where no switches or indicators are mounted but support is needed, EAO has developed a patented, adjustable spacer. The spacer is inserted into a special mounting flange which automatically compensates for panel thickness.

(see drawing below) The spacer is first attached to the rear of the panel by removing a protective foil which exposes a special high strength adhesive surface. There are four flexible ears on the spacer which prevent the adhesive from contacting the surface. When the PCB is mated with the panel containing switches and indicators, a firm push on the spacer will flex the ears aside and the adhesive will bond to the panel surface. The special mounting flange has insertion steps of 1.5, 2, 2.5, 3, 3.5, and 4 mm which enable the PCB to maintain a constant 12 mm distance from the front panel.

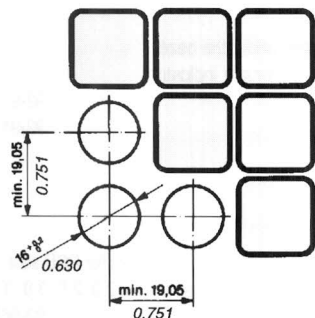
6. Do not fully tighten the screws which attach the mounting flanges to the PCB until the circuit board and the panel are assembled together. This aids in aligning the components.
7. The PCB can easily be removed by removing the screws which hold the mounting flange to the PCB.



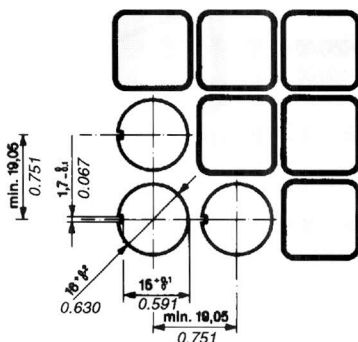
Printed Circuit Board Switches

Series 92 Dimensions & Mounting Information

Hole Patterns

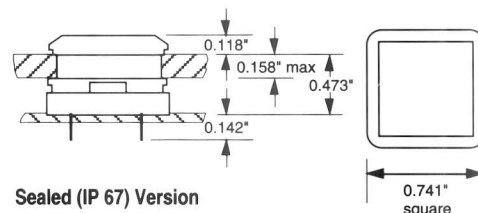


Without anti-rotation protection

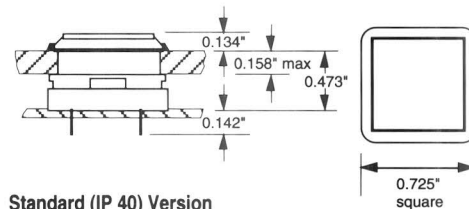


With anti-rotation protection

Dimensions

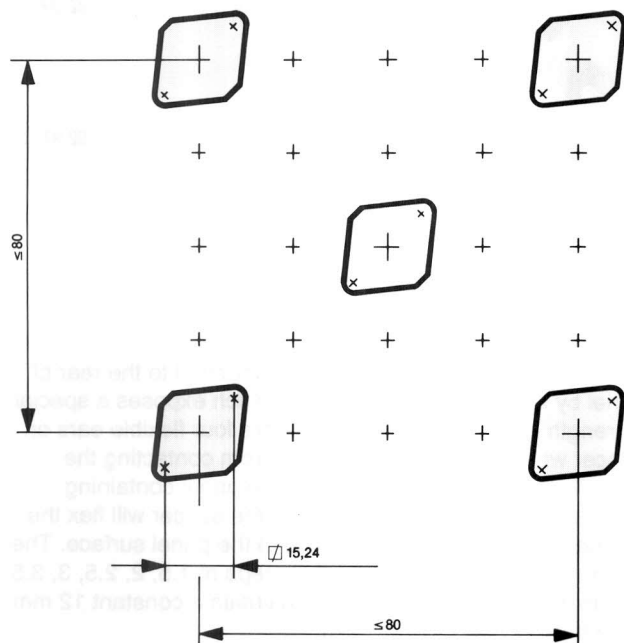


Sealed (IP 67) Version



Standard (IP 40) Version

Series 92 array. The positioning and number of mounting flanges is determined by the size of the front panel and PCB. For a consistent tactile operation, position mounting flanges as shown below. Suitable for PCB of 1.6 mm thickness.



To convert from
mm to inches:
multiply by 0.0394

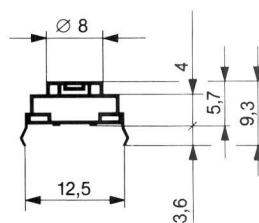
Series 92 PCB layouts (foil side of the board)

Code: 1 or 2 = Fastening holes for mounting flange

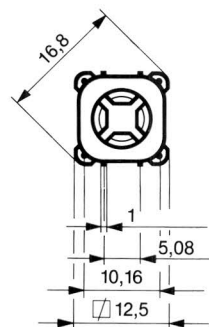
A or B = Holes for LED

C₁D₁ or C₂D₂ = Holes for centering pins

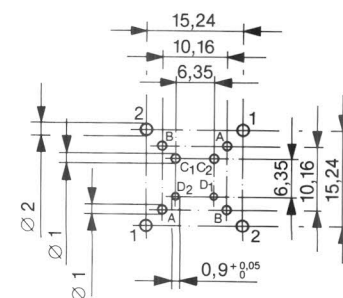
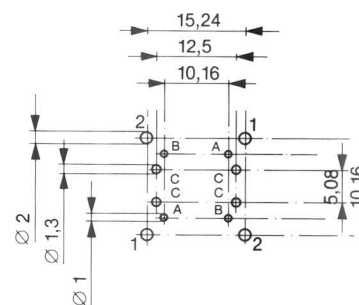
C = Holes for switch element



Pushbutton



Indicator



Printed Circuit Board Switches

Series 96

Sealed PCB-mounted Switch —Available with one or two LEDs

FEATURES

- 42 V AC/DC, 100 mA maximum
- Sealed switch—IP 67 exceeds NEMA 4 and 13
- Consistent tactile feel
- One or two LED illumination
- SPDT gold snap-acting contacts
- 5-million operations
- Dual in-line package dimensions
- Momentary or maintained action

Reference

Accessories	page 82
Lamps	page 94
Legends	page 100
Technical Specifications	page 104

To order: See part ordering system on next page.

Description

General Information: EAO Series 96 is the finest low profile circuit mounted product in its category. The Series 96 is environmentally sealed, meeting IP 67 specifications (watertight to a depth of 3 feet). The design of the Form "C" Contact is unsurpassed in quality and reliability.

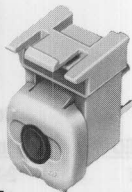
Mounting: Designed to mount on a printed circuit board. Since the low profile switch is completely sealed (IP 67) it can be flow soldered. A locating pin assures dimensionally exact assembly in rows or blocks.

Key Caps: Standard key caps for momentary or maintained operation feature four dimensions: 17.4 x 12.4; 17.4 x 14.8; 17.4 x 17.4; and 17.4 x 35.2 mm (0.685 x 0.488; 0.685 x 0.582; 0.685 x 0.685; and 0.685 x 1.386 "). Euro-style key caps are 17.4 x 12.4.

Illumination: Key caps are available for use with one or two T-1 bi-pin LEDs (colors: red, yellow, green).

Legend engraving: For engraving or film insertion see pages 102 and 103.

Low-Profile SEALED PC-Board Switch and Socket



96-323.837

Description	Part Number
Switch Module, 1PDT, Form "C", gold contacts	96-323.837
Socket for Indicator and Panel Plug	96-302.807



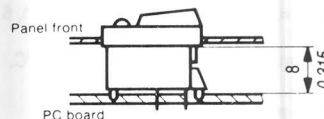
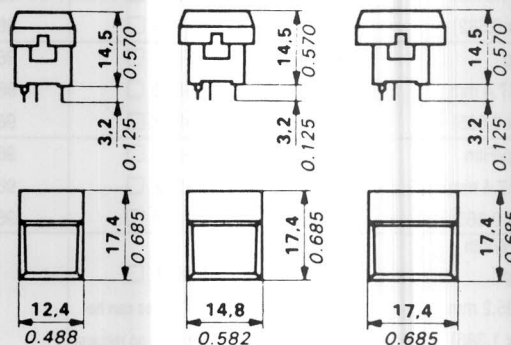
96-110.00 (momentary action, 17.4 x 12.4 mm, no LED, no legend, black key cap)

96-221.022 (maintained action, 17.4 x 14.8 mm, one LED, no legend, red key cap, red LED)

96-132.0224 (momentary action, 17.4 x 17.4 mm, two LEDs, no legend, red key cap, red LED, yellow LED)

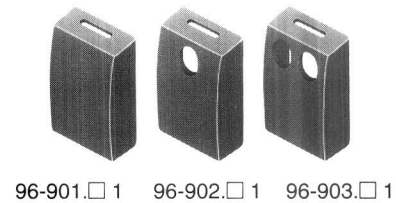
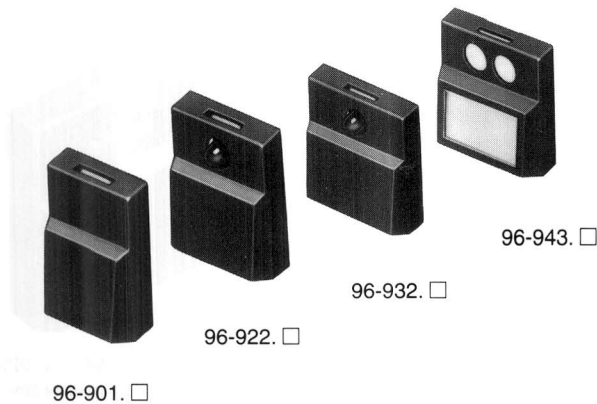
Complete part numbers
(see next page for part numbering system)

Switch Modules



Printed Circuit Board Switches

Series 96 Switch Modules



Euro-style Key Caps

Add color digit ☐

Description		Momentary Action	Maintained Action
Key Cap	No LED	96-901. <input type="checkbox"/> 1	96-905. <input type="checkbox"/> 1
17.4 x 12.4 mm	1 LED	96-902. <input type="checkbox"/> 1	96-906. <input type="checkbox"/> 1
(0.685 x 0.488)	2 LEDs	96-903. <input type="checkbox"/> 1	96-907. <input type="checkbox"/> 1

☐ Color code for Key Caps: 0 = Black, 2 = Red, 5 = Green, 8 = Gray

Key Caps

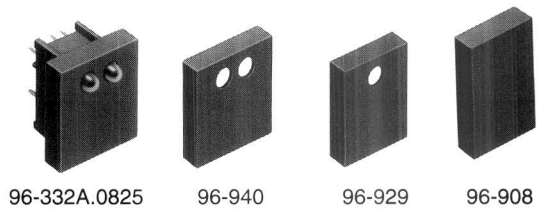
Add color digit ☐

Description		Momentary Action	Maintained Action
Key Cap	No LED	96-901. <input type="checkbox"/>	96-905. <input type="checkbox"/>
17.4 x 12.4 mm	1 LED	96-902. <input type="checkbox"/>	96-906. <input type="checkbox"/>
(0.685 x 0.488)	2 LEDs	96-903. <input type="checkbox"/>	96-907. <input type="checkbox"/>
Key Cap	No LED	96-921. <input type="checkbox"/>	96-925. <input type="checkbox"/>
17.4 x 14.8 mm	1 LED	96-922. <input type="checkbox"/>	96-926. <input type="checkbox"/>
(0.685 x 0.582)	2 LEDs	96-923. <input type="checkbox"/>	96-927. <input type="checkbox"/>
Key Cap	No LED	96-931. <input type="checkbox"/>	96-935. <input type="checkbox"/>
17.4 x 17.4 mm	1 LED	96-932. <input type="checkbox"/>	96-936. <input type="checkbox"/>
(0.685 x 0.685)	2 LEDs	96-933. <input type="checkbox"/>	96-937. <input type="checkbox"/>
Key Cap/Film	No LED	96-941. <input type="checkbox"/>	96-945. <input type="checkbox"/>
17.4 x 17.4 mm	1 LED	96-942. <input type="checkbox"/>	96-946. <input type="checkbox"/>
(0.685 x 0.685)	2 LEDs	96-943. <input type="checkbox"/>	96-947. <input type="checkbox"/>
Double Width Key Cap	No LED	96-951. <input type="checkbox"/>	
17.4 x 35.2 mm		LED holes can be supplied on request	
(0.685 x 1.386)			

☐ Color code for Key Caps:

0 = Black, 2 = Red, 3 = Orange*, 4 = Yellow*, 5 = Green, 6 = Blue*, 8 = Gray, 9 = White*

* These colors have an upper temperature range of 70°C.



Indicator Key Caps/Panel Plugs

Add color digit ☐

Description		Indicator Key Caps* Part No.	Panel Plugs* Part No.
17.4 x 12.4 mm (0.685 x 0.488)	No LED	—	96-908. <input type="checkbox"/>
	1 LED	96-909. <input type="checkbox"/>	—
	2 LEDs	96-910. <input type="checkbox"/>	—
17.4 x 14.8 mm (0.685 x 0.582)	No LED	—	96-928. <input type="checkbox"/>
	1 LED	96-929. <input type="checkbox"/>	—
	2 LEDs	96-930. <input type="checkbox"/>	—
17.4 x 17.4 mm (0.685 x 0.685)	No LED	—	96-938. <input type="checkbox"/>
	1 LED	96-939. <input type="checkbox"/>	—
	2 LEDs	96-940. <input type="checkbox"/>	—

☐ Color code for Key Caps, Indicator Keys, and Panel Plugs:

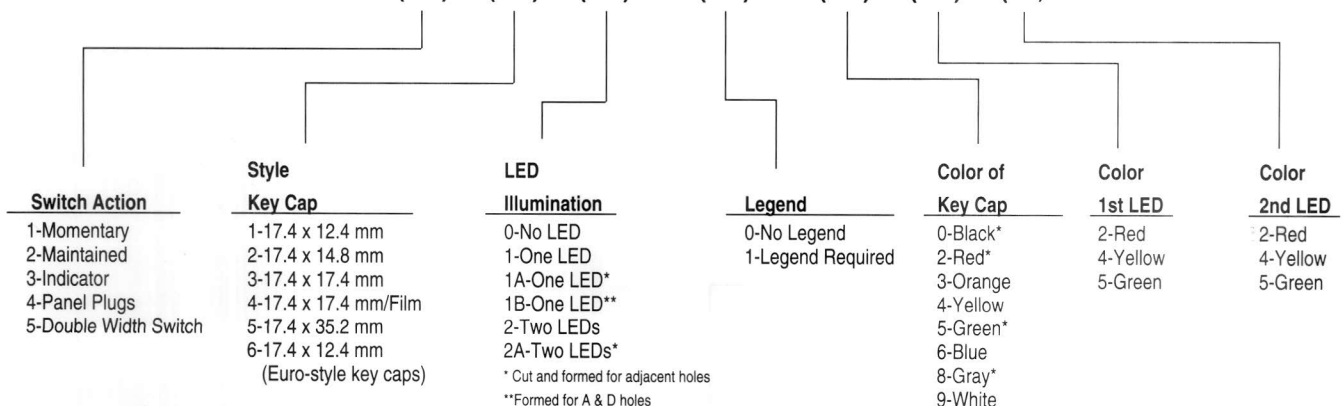
0 = Black, 2 = Red, 5 = Green, 8 = Gray,

* Requires Socket 96-302.807

These lenses and panel plugs have an upper temperature range of 70°C.

Part Ordering System

96 - () () () . () () () ()



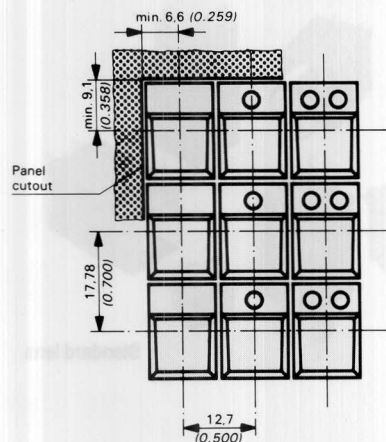
* Cut and formed for adjacent holes

**Formed for A & D holes

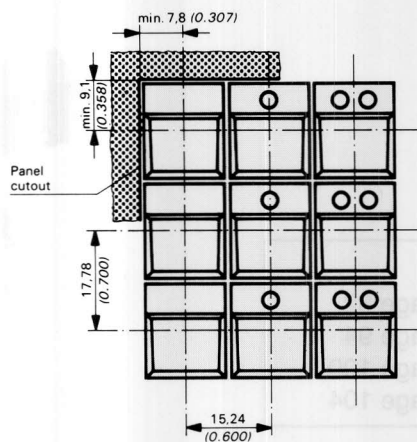
* Only colors available for indicators, panel plugs, and Euro-style key caps

Printed Circuit Board Switches

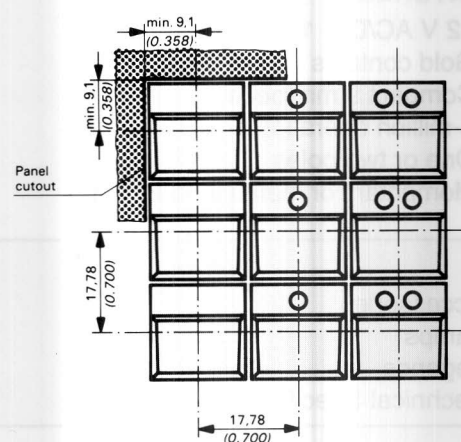
Series 96 Matrix Assembly and Panel Cutout Dimensions



Key Cap, 17.4 x 12.4 mm



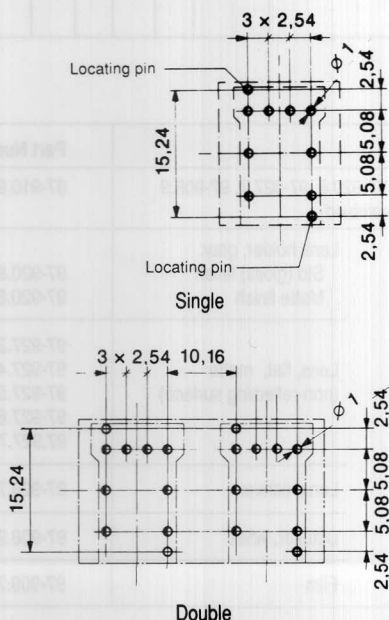
Key Cap, 17.4 x 14.8 mm



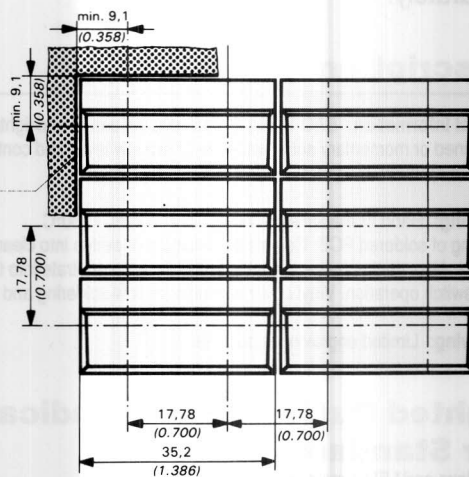
Key Cap, 17.4 x 17.4 mm

Terminals, PC-board layout for Switch Module, Indicator, and Panel Plug

PCB Dimensions (Bottom view)



To convert from
mm to inches:
multiply by 0.0394



Double Key Cap
17.4 x 35.2 mm

Printed Circuit Board Switches

Series 97

Miniature PCB-mounted Switch and Indicator with LED Illumination

FEATURES

- 42 V AC/DC, 100 mA
- Gold contacts
- Compact 9 mm bezel
- 5-million operations
- One or two poles
- Momentary or maintained action

Reference

Accessories	page 82
Lamps	page 94
Legends	page 100
Technical Specifications	page 104

To order: Select pushbutton or indicator desired, indicating contacts where applicable. Then order lens and LED separately.

Description

General Information: EAO Series 97 includes indicators and lighted pushbuttons with maintained or momentary action with one or two low level gold contacts. Bezels are 9 mm (0.354) round or square, or 12.2 mm (0.480) square.

Soldering: Hand or machine soldering: <5 seconds, <260°C

Cleaning of soldered PCB: Complete immersion of switch into cleaning solvent must be avoided. Also, contaminated cleaning solvent could penetrate into the switch which may affect switch operation. Vinyl cover available for flow soldering and wash.

Engraving: Limited engraving is possible.

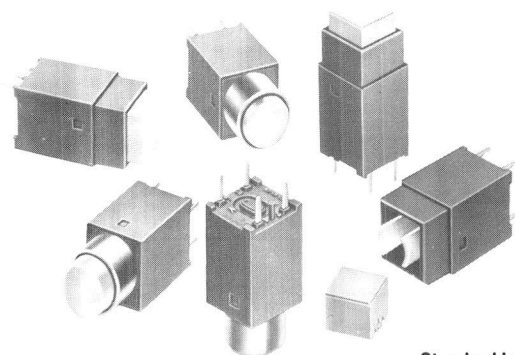
Lighted Pushbuttons & Indicators For Standard Lens

Order lens and LED separately

Switch Elements	Momentary		Maintained	
	Square	Round	Square	Round
1 N.O. (Pins 3-4)	97-350.037	97-330.037	97-380.037	97-370.037
2 N.O.	97-351.037	97-331.037	97-381.037	97-371.037
1 N.C. (Pins 1-2)	97-352.037	97-332.037	97-382.037	97-372.037
1 N.O., 1 N.C.	97-353.037	97-333.037	97-383.037	97-373.037
Indicators	Square		Round	
	97-081.007		97-061.007	

Lighted Pushbuttons & Indicators For Overhanging Lens

Switch Elements	Momentary	Maintained
	Square	Square
1 N.O. (Pins 3-4)	97-320.037	97-360.037
2 N.O.	97-321.037	97-361.037
1 N.C. (Pins 1-2)	97-322.037	97-362.037
1 N.O., 1 N.C.	97-323.037	97-363.037
Indicator	Square	
	97-041.007	



Standard lens



Overhanging lens

Lenses

☐ Add color digit

Standard Lens	Part Number		0	2	4	5	6	7	8	9
	Square	Round								
Transparent lens with translucent diffuser	97-951.□	97-931.□	✓	✓	✓	✓	✓		✓	✓
Transparent lens with transparent diffuser	97-952.□	97-932.□		✓	✓	✓	✓	✓		

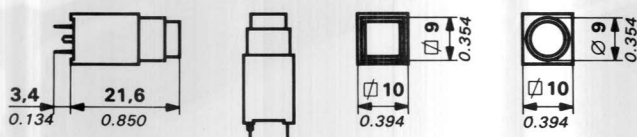
Overhanging Lens		Part Number
Complete lens, consisting of 97-920.8, 97-927.7, 97-908.9 (Complete set of parts, unassembled)		97-910.9
Component Parts or Accessories	Lens holder, gray: Std (gloss) finish	97-920.8
	Matte finish	97-920.82
	Lens, flat, matte (non-reflecting surface)	97-927.2 97-927.4 97-927.5 97-927.6 97-927.7
	Lens, convex	97-929.7A
	Diffuser, white	97-908.9
	Film	97-909.7

0 = Black, 2 = Red, 4 = Yellow, 5 = Green, 6 = Blue, 7 = Clear, 8 = Gray, 9 = White. Black and gray are opaque.

Printed Circuit Board Switches

Series 97 Dimensions & Mounting Information

Standard Lens Style Outline Dimensions



Base Diagrams for Both Lens Styles

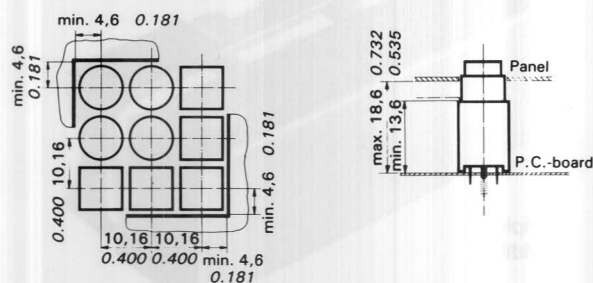


Indicator

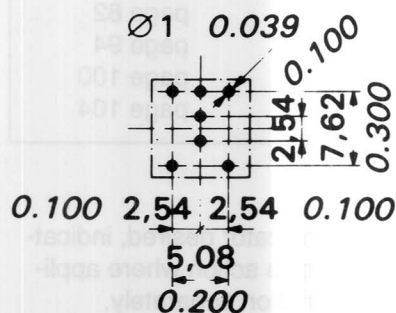


Lighted Pushbutton

Panel Cutout and Mounting Dimensions

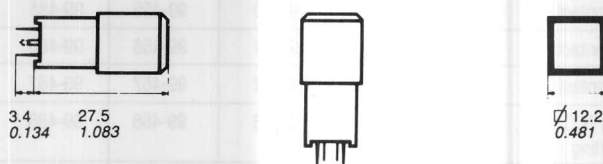


Printed Circuit Board Layout (View: solder side)

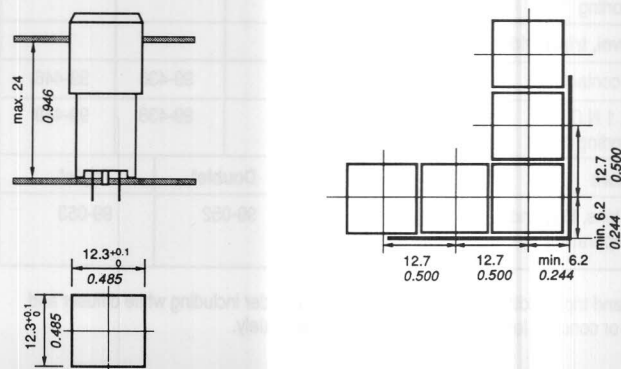


Overhanging Lens Style

Outline Dimensions



Panel Cutout and Mounting Dimensions



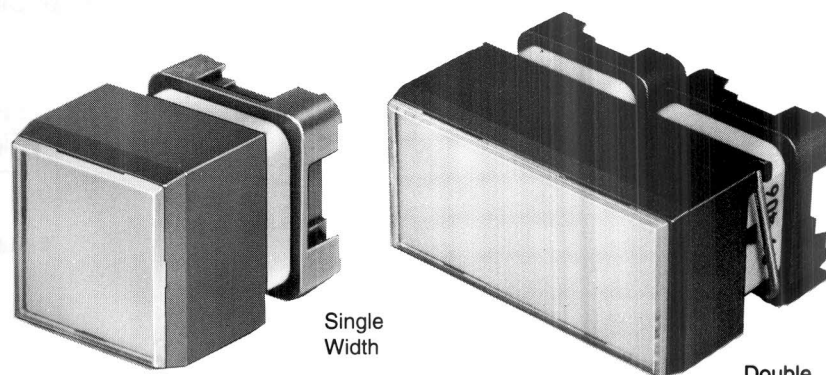
Printed Circuit Board Switches

Series 99

PCB-Mounted Lighted Pushbuttons and Indicators

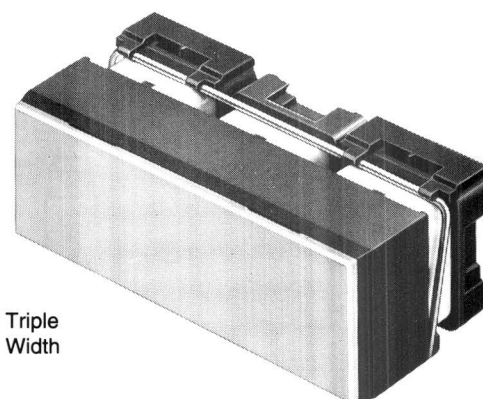
FEATURES

- 42 VAC/0.1 A, 42 VDC/0.1 A
- Mount directly on printed circuit board for flow soldering; washable if vinyl cover is used
- Provision for assembling in-line or matrix arrangements before mounting
- Choice of tactile or non-tactile action
- Choice of lens and color
- Front-panel replaceable lens and lamp



Double Width

Single Width



Triple Width

Reference

Series 99 Keylock	page 63
Accessories	page 82
Lamps	page 94
Legends	page 100
Technical Specifications	page 104

To order: Select pushbutton or indicator desired, indicating contacts and tactile or non-tactile action where applicable. Then order lens and illumination separately.

Lighted Pushbuttons & Indicators

Pushbuttons (Order lens, film, and lamp separately)	Tactile Action		Non-Tactile Action	
	Momentary	Maintained	Momentary	Maintained
Low level, single width with one lampholder				
1 N.O. contact	99-450	99-480	99-455	99-485
2 N.O. contacts	99-451	99-481	99-456	99-486
1 N.C. contact	99-452	99-482	99-457	99-487
1 N.O., 1 N.C. non-shorting	99-453	99-483	99-458	99-488
Low level, double width* with two lamp holders				
2 N.O. contacts	—	—	99-406	99-416
1 N.O., 1 N.C. non-shorting	—	—	99-408	99-418
Low level, triple width* with three lamp holders				
2 N.O. contacts	—	—	99-436	99-446
1 N.O., 1 N.C. non-shorting	—	—	99-438	99-448
Indicators	Single	Double*	Triple*	
(Order lens, film, and lamp separately)	99-050	99-052	99-053	

*Double and triple width supplied with integral lens holder including white diffuser and clear flat or concave lens. Order lamps and film separately.

Lenses

☐ Add color digit

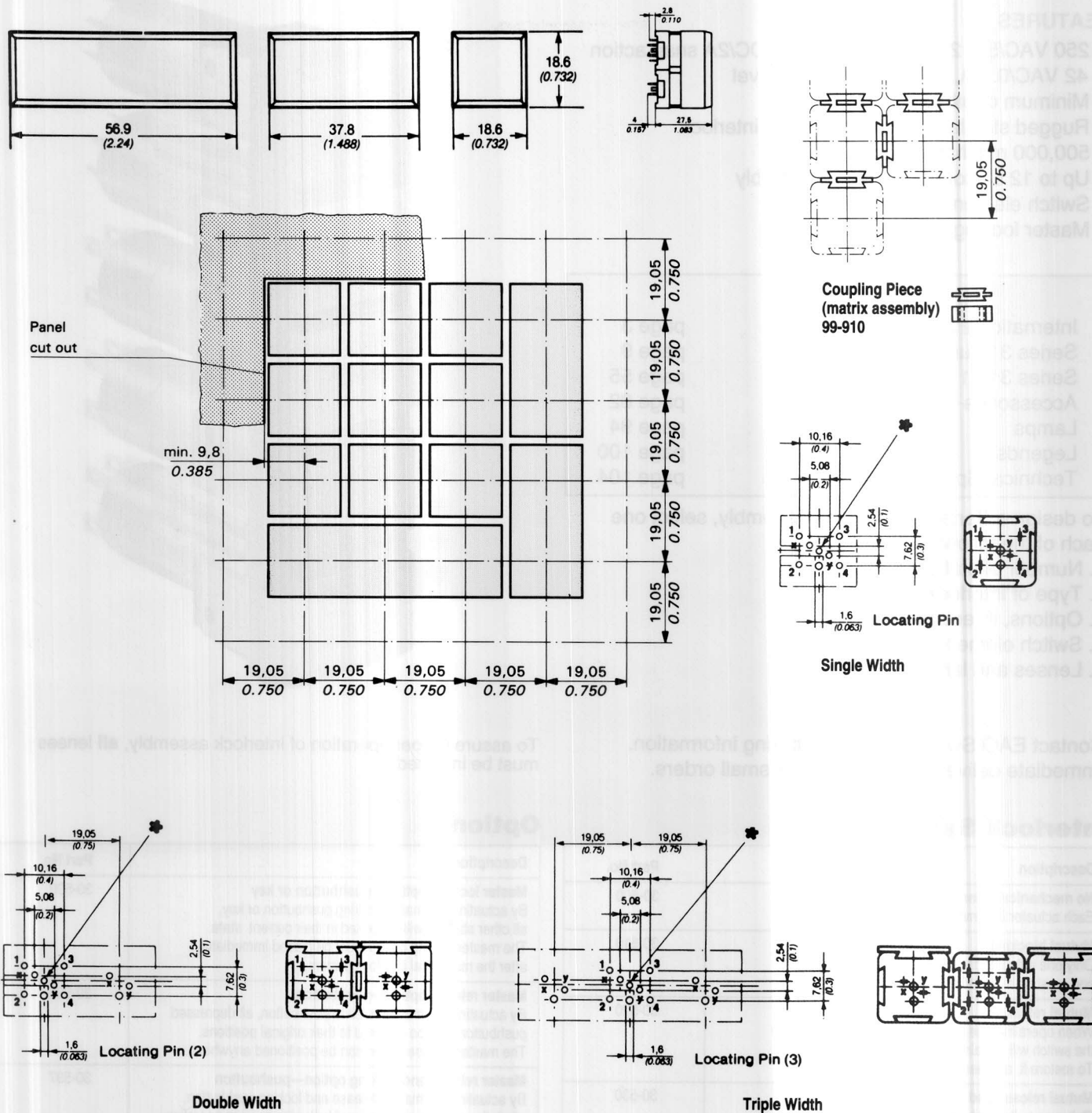
Description	Single	Double	Triple
Lens holder with standard lens flat	99-901.9	—	—
and white diffuser (complete set of parts, unassembled) concave	99-902.9	—	—
Film, inserted red	99-909.2	99-964.2	99-969.2
between lens yellow	99-909.4	99-964.4	99-969.4
and diffuser green	99-909.5	99-964.5	99-969.5
blue	99-909.6	99-964.6	99-969.6
Lens holder, gray std (gloss) finish	99-920.8	—	—
matte finish	99-920.82	—	—
Lens holder, gray, with dust seal*	99-925.8	—	—
Std lens, transparent: flat	99-921.7	99-961.7	99-966.7
concave	99-922.7	99-962.7	99-967.7
Matte lens, transparent flat	99-927.7	99-973.7	99-978.7
concave	99-928.7	99-974.7	99-979.7
round indent	99-928.7A	—	—
convex	99-929.7A	—	—
Diffuser	99-908. <input type="checkbox"/>	99-963. <input type="checkbox"/>	99-968. <input type="checkbox"/>
Coupling piece	99-910	99-910	99-910
Lens guard Inserted between switches for protection	99-912.0	—	—

Colors: 0 = Black, 9 = White

*Meets IP 60

Printed Circuit Board Switches

Series 99 Dimensions & Mounting Information



* Hole optional. To secure switch to PCB use M 1.2 screw.
Diameter 1.6 mm (0.063)
All holes except locating pin holes are Ø1 mm (0.04)

Mechanical Interlocked Switch System

Series 30 Interlocked Assemblies

FEATURES

- 250 VAC/5A, 220 VDC/0.1 A, 24 VDC/2A snap action
42 VAC/0.1 A, 42 VDC/0.1 A low level
- Minimum depth: 1.71"
- Rugged stainless steel mechanical interlock
- 500,000 mechanical operations
- Up to 12 stations in a single assembly
- Switch elements removable
- Master locking with a key

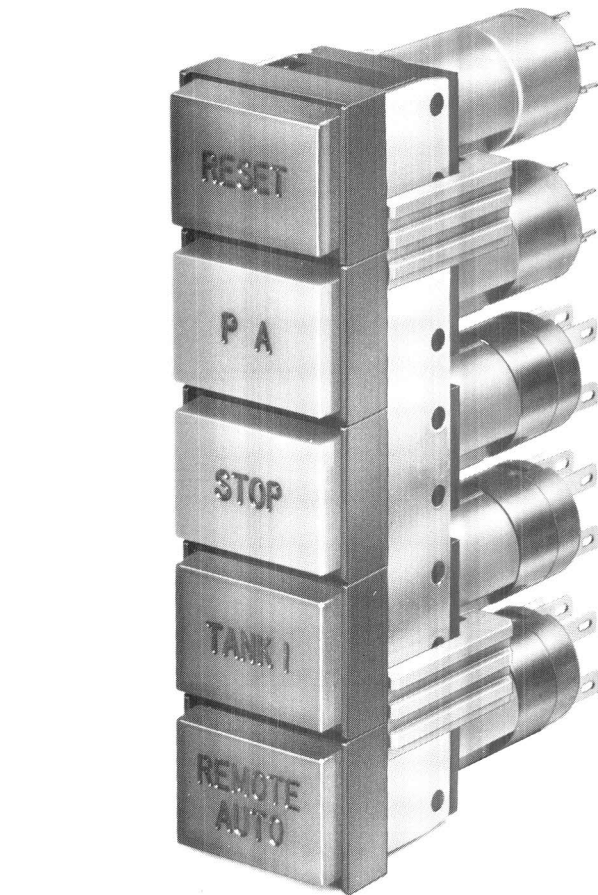
Reference

International Approvals	page 3
Series 31 pushbuttons	page 9
Series 31/51 keylocks	page 55
Accessories	page 82
Lamps	page 94
Legends	page 100
Technical Specifications	page 104

To design a Series 30 Interlock Assembly, select one each of the following:

1. Number of stations, up to 12
2. Type of interlock system
3. Options, if required
4. Switch elements
5. Lenses and lamps

Contact EAO Switch Corp. for ordering information.
Immediate delivery of prototypes or small orders.



To assure proper operation of interlock assembly, **all** lenses must be installed.

Interlock Systems

Description	Part No.
No mechanical interlock function Each actuator is completely independent.	30-500
Mutual blocking Only one actuator can be operated at one time and must be released by a second push.	30-510
Mutual release When operating one switch (or more) simultaneously the switch will remain in the depressed position. To restore it, another switch must be pressed.	30-520
Mutual release and blocking Only one switch can be operated at a time. It can be released by pushing another switch.	30-530
Individual operation with master release All switches can be operated independently. By pushing the master release switch, all other switches will be restored to their original position. Any position of the master release switch is possible. (Please indicate desired position.)	30-540
Sequential operation with master release Actuators must be operated sequentially, one by one. The operated actuators are restored to their original position by pushing the master release button, which is placed at the end of the interlock systems.	30-550

Options

Description	Part No.
Master locking option—pushbutton or key By actuating the master locking pushbutton or key, all other stations will be locked in their current state. The master locking option must be placed immediately after the mechanical interlock system.	30-599
Master release option—pushbutton By actuating the master release pushbutton, all depressed pushbuttons will be restored to their original positions. The master release option can be positioned anywhere.	30-598
Master release and locking option—pushbutton By actuating the master release and locking pushbutton, all stations will be released and locked to prevent operation. This option can be placed anywhere.	30-597
Master release and locking option—key By turning the master release and locking key, all stations will be released and locked to prevent operation. This option must be placed immediately after the mechanical interlock system.	30-596
Master release and locking option for sequential interlock system—pushbutton or key By actuating master release and locking pushbutton or key, all other stations will be released and locked to prevent operation. This option must be placed immediately preceding the interlock system.	30-595

Mechanical Interlocked Switch System

Switch Elements & Spacers

Description	Part Number
Low level, 2 make contacts	30-750.836
Low level, 2 break contacts	30-751.836
Low level, 1 make, 1 break	30-752.836
1 pole, snap-acting	30-760.825
2 pole, snap-acting	30-761.825
3 pole, snap-acting	30-762.825
4 pole, snap-acting	30-763.825
1 pole, snap acting, 0.110" QC terminals	30-768.822
Spacer with 0.110" QC terminals	30-769.802
Spacer with universal terminals	30-770.806

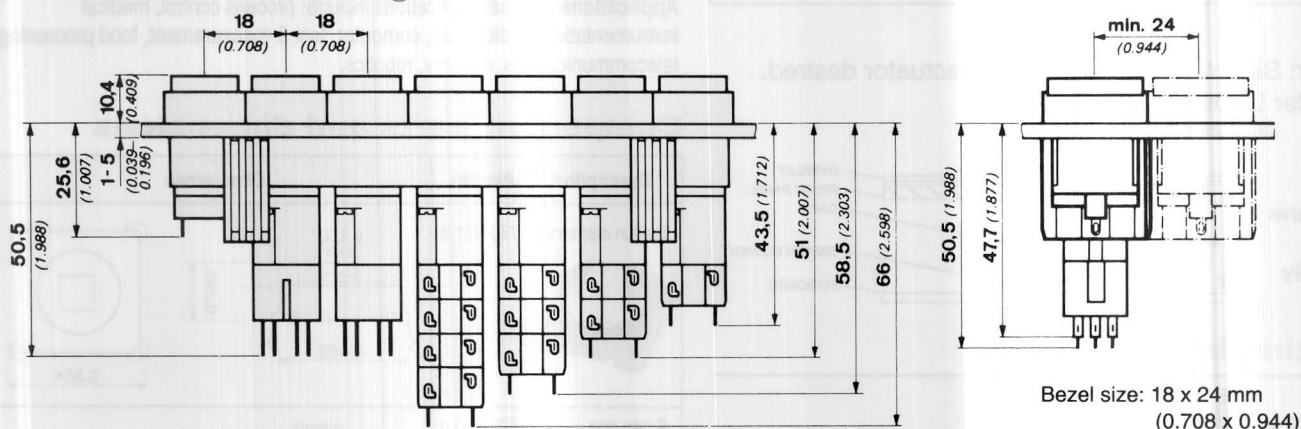
Series 30 Lenses

☐ Add color digit

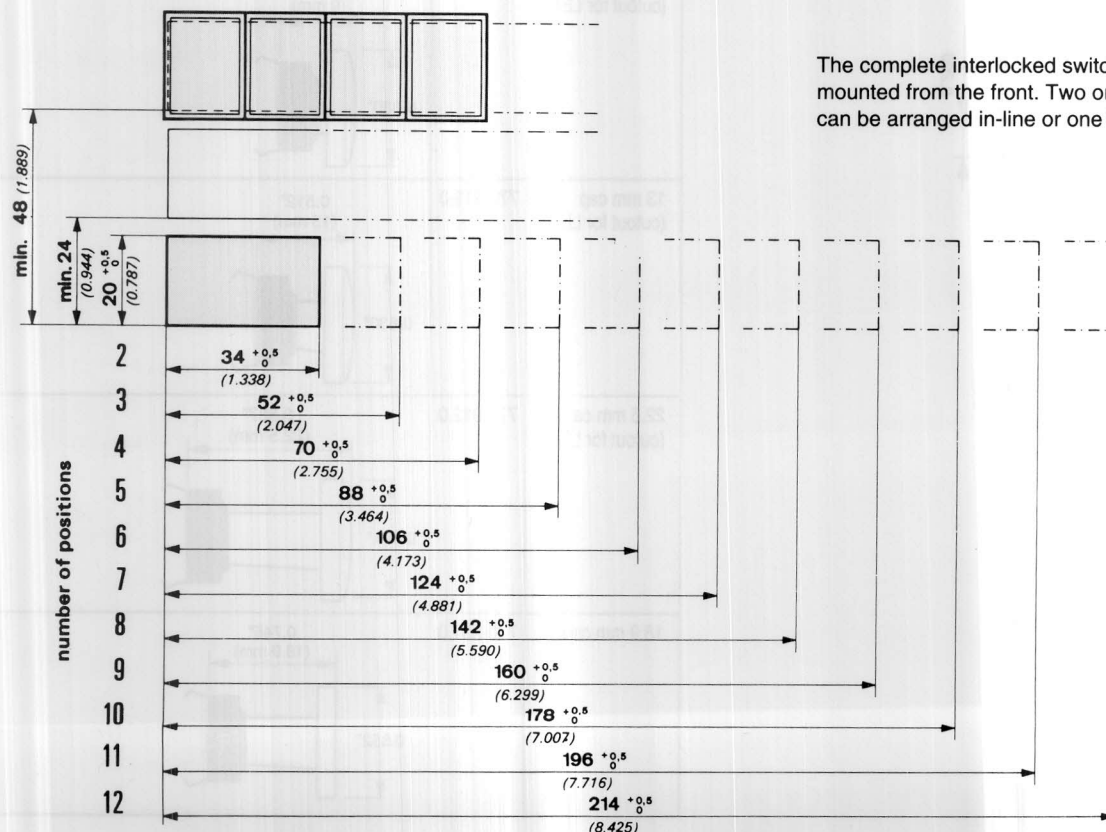
Description	Rectangular	0	1	2	3	4	5	6	7	8	9
Flat Lens											
Translucent	31-901.□	✓		✓	✓	✓	✓	✓		✓	✓
Transparent	31-903.□		✓	✓	✓	✓	✓	✓	✓		
Transparent with clear diffuser	31-905.□			✓		✓	✓		✓		
Concave											
Translucent	31-902.□	✓		✓	✓	✓	✓	✓		✓	✓
Transparent	31-904.□			✓	✓	✓	✓	✓	✓		
Transparent with clear diffuser	31-906.□			✓		✓	✓		✓		

□ 0 = Black, 1 = Solar Black, 2 = Red, 3 = Orange, 4 = Yellow, 5 = Green, 6 = Blue
7 = Clear, 8 = Gray, 9 = White. Black and Gray are opaque.

Dimensions & Mounting Information



The complete interlocked switch assembly can be mounted from the front. Two or more assemblies can be arranged in-line or one below the other.



Membrane Switching System

Series 70

Switch Elements and Caps for Membrane Systems

FEATURES

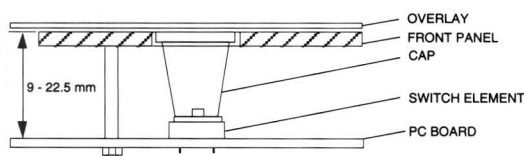
- SPST contacts rated at 42 V, 50 mA
- More than 5-million operations
- Gold contacts
- Low 0.4 mm switch travel
- Excellent tactile feel
- Use one or two LEDs for illumination

Reference

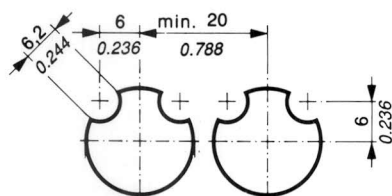
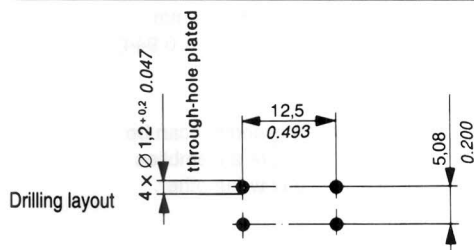
Series 92 PCB switches	page 65
Accessories	page 82
Lamps	page 94
Technical Specifications	page 104

To order: Select switch element and actuator desired. Then order LEDs separately.

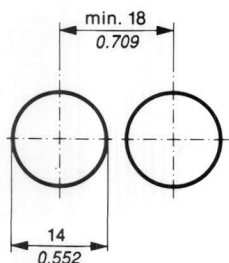
Typical membrane system assembly



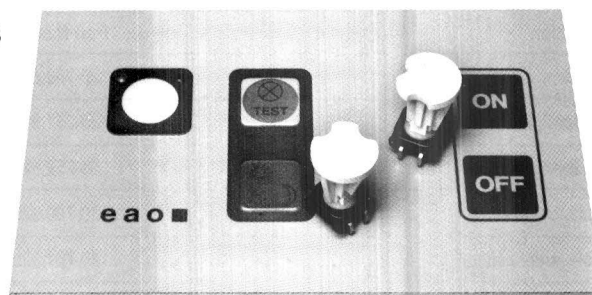
Mounting Information



Cap spacing with holes for LED



Cap spacing without holes for LED


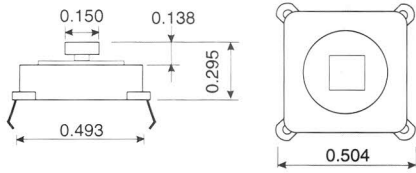
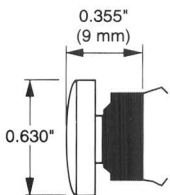
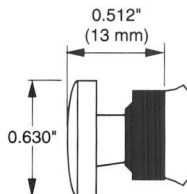
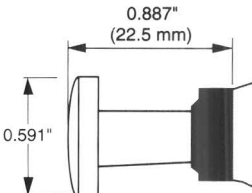
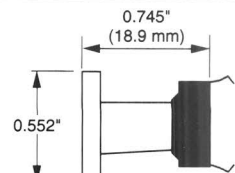


Description

General information: The Series 70 pushbutton switch elements and caps are ideally suited for designing a complete membrane switching system. Industrial designers can employ custom cap colors, shapes, and styles. The low profile switch element design allows construction of very compact panel-to-PCB dimensions.

Applications: Typical applications include: process control, medical instrumentation, audio/video, computer, test & measurement, food processing, telecommunications, security, robotics.

Component parts and dimensions

Description	Part No.	Dimensions
Switch element 	770-201.0	
9 mm cap (cutout for LEDs)	770-910.0	
13 mm cap (cutout for LEDs)	770-911.0	
22.5 mm cap (cutout for LEDs)	770-912.0	
18.9 mm cap	770-901.0	

Buzzers

Series 02 and 03 Buzzers

FEATURES

- 10-220 VAC, 10-110 VDC operation
- Minimum depth: 2.95"
- Adjustable sound level
- Continuous or intermittent operation

Technical Information

Sound level	≤90 dB @ 0.1 m
Sound frequency	2.8 kHz
Intermittent frequency	3 Hz
Operating temperature	-25°C to 55°C (-13°F to 131°F)
Storage temperature	-40°C to 85°C (-40°F to 185°F)

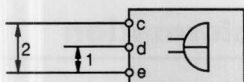
Specifications & Part Numbers

Description	Part Number (Indicate Bezel)		Typical Input Current	Resistance for Sound Level
	02	03		
10-55 V AC or 10-75 V DC	02-810.001 □	03-810.001 □	25 mA AC 15 mA DC	1 MΩ
110 V AC/DC or 220 V AC	02-811.001 □	03-811.001 □	110 V: 8 mA AC/DC 220 V: 13.6 mA AC 9.0 mA DC	1 MΩ

□ Indicate bezel style: A=Flat, B=Two sided raised, C=Four sided raised. Black is standard, also available in other colors.

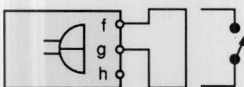
Connection Information

02/03-810.001 □



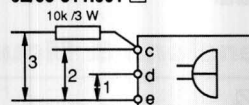
1. 10-35 V AC
10-50 V DC
2. 30-55 V AC
35-75 V DC

02/03



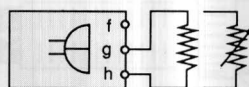
Intermittent Operation

02/03-811.001 □



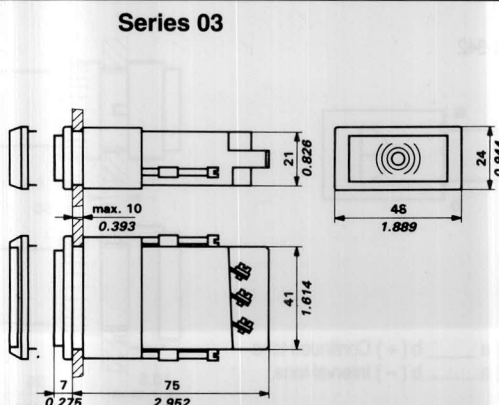
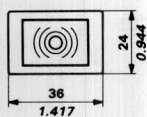
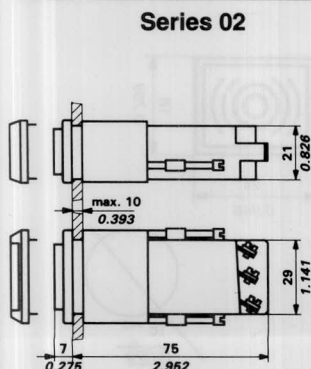
1. 110 V AC/DC (+10%, -20%)
2. 220 V AC (+10%, -20%)
3. 220 V DC (+10%, -20%)

02/03



Sound Level

Dimensions



Series 04 / 14 Buzzers

FEATURES

- 24 VDC operation
- Minimum depth: 1.38"
- Oil and watertight, meets IP 65 and NEMA 4 and 13
- Self-contained oscillator

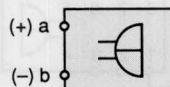
Technical Information

Sound level	≥85 dB @ 0.1 m
Sound frequency	2.8 kHz
Voltage	24 V DC ±10%
Current	≥20 mA
Sealing	IP65 according to IEC 529
Storage & operating temperatures	-25°C to 50°C (-13°F to 122°F)
Materials	Case and plastic front cap Front cap, metal
	Polyamide Chromium-plated brass, salt water proof

Specifications & Part Numbers

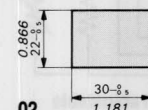
Description	Part Number	Depth from front of panel to rear of switch
24 V DC Buzzer with plastic front cap	14-810.002	35 mm (1.38)
24 V DC Buzzer with metal front cap	14-810.902	35 mm (1.38)

04/14 Buzzer Connection

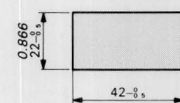


04 Buzzer

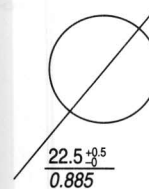
Mounting Holes



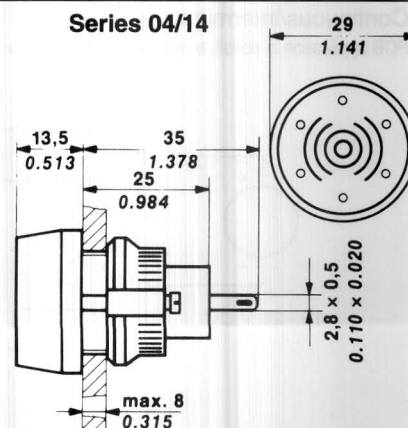
02



03



04/14



Buzzers

Series 31 Buzzers

FEATURES

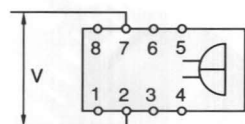
- 10 V to 75 V, AC or DC operation
- Minimum depth: 1.42"
- Self-contained buzzers
- Adjustable sound level
- Continuous or intermittent sound
- Low power consumption

Specifications & Part Number

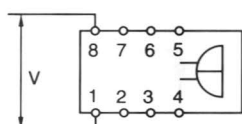
Description	Part Number	Depth from front of panel to rear of buzzer
Printed circuit board connections 10-55 V AC 10-75 V DC	31-810.005	67 mm (2.64)
0.110" Q.C. connections 10-26 V DC	31-801.002	36 mm (1.417)

Connection Information

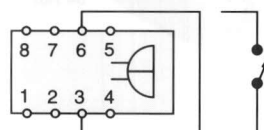
31-810.005



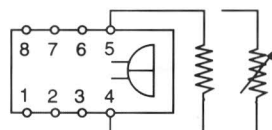
Continuous buzz
V = 10-35 V AC
V = 10-50 V DC



Continuous buzz
V = 35-55 V AC
V = 35-75 V DC



Intermittent buzz
Interval duration
approximately 3 Hz

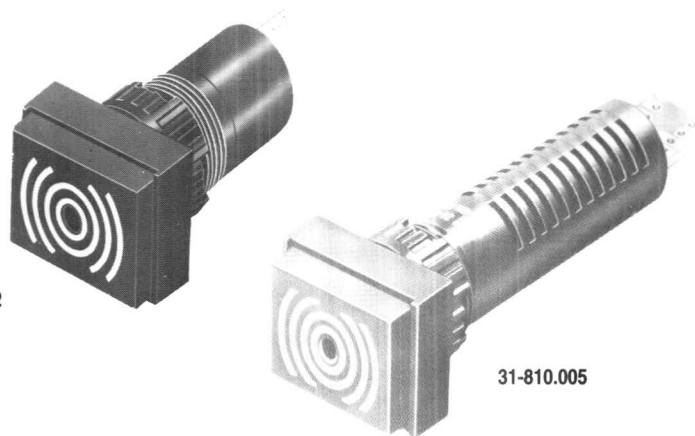
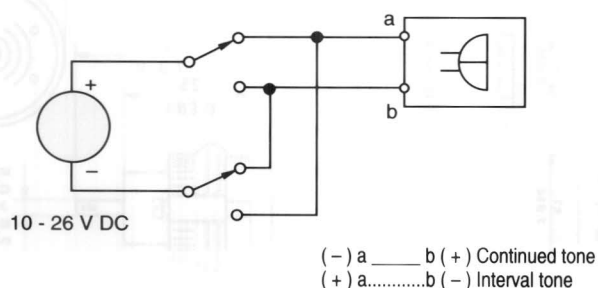


Sound level adjustable
Potentiometer = 1 MΩ

31-801.002

Continuous/intermittent application

PCB application is possible by using PCB connector 31-942



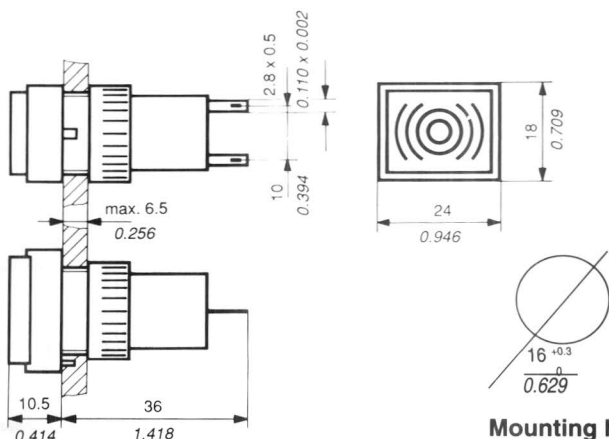
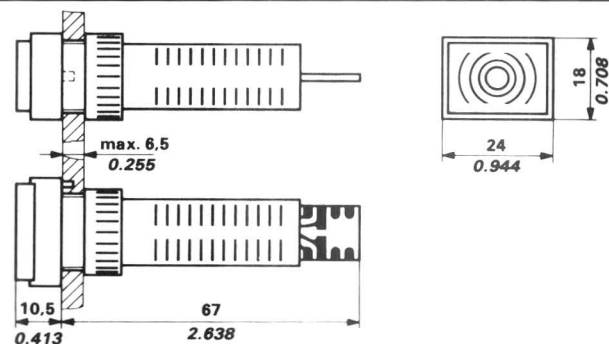
31-801.002

31-810.005

Technical Information

	31-810.005	31-801.002
Sound level	≤90 dB @ 0.1 m	95 dB @ 0.1 m
Sound frequency	2.8 kHz	2.0 kHz
Intermittent frequency	3 Hz	4 Hz
Sound level resistance (pot.)	1 MΩ	--
Input current	25 mA AC 15 mA DC	≤30 mA DC
Operating temperature	-25°C to 55°C (-13°F to 131°F)	-25°C to 55°C (-13°F to 131°F)
Storage temperature	-40°C to 85°C (-40°F to 185°F)	-25°C to 55°C (-13°F to 131°F)
Case material	Polythermide, self-extinguishing	

Dimensions & Mounting Information



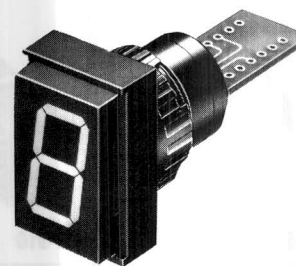
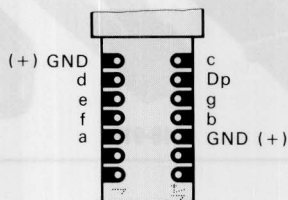
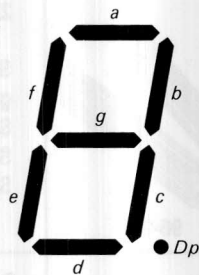
Mounting hole

LED Readout

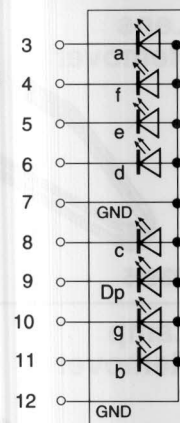
Series 31 7-Segment LED Readout

FEATURES

- Operates at 1.9 VDC
- Current per segment: 15 mA
- Minimum depth: 1.54"
- Accepts DIP socket
- Seven segment Ga-P element
- Includes decimal point



Will accept
Dip-socket

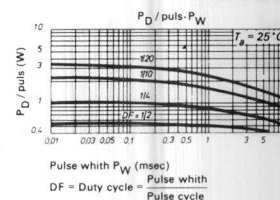
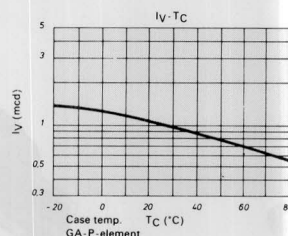
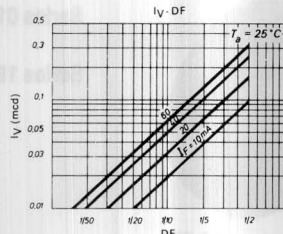
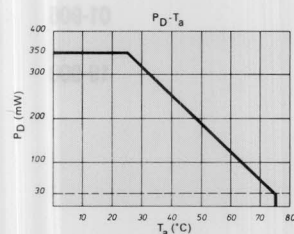
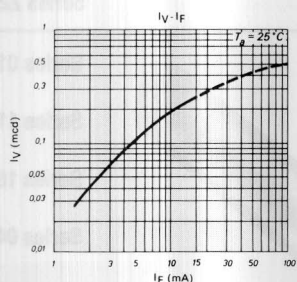
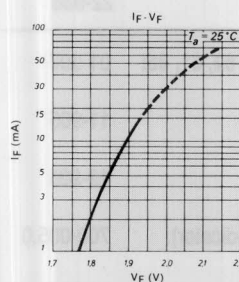


Specifications & Part Number

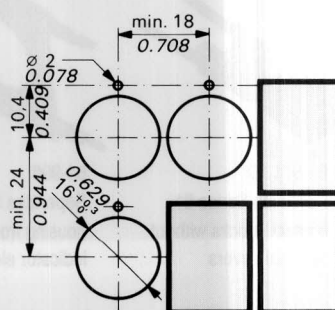
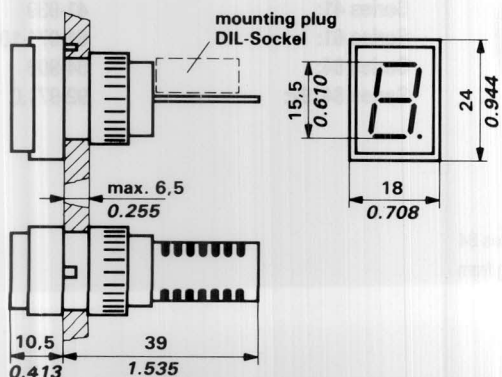
Description	Part Number
The device contains a 7-segment Ga-P element including decimal point with common anode. Should be current limited when energized. Supplied with solar black lens. (Common cathode available upon request, Part Number 31-023.005.)	31-022.005

Technical Information

Part Number 31-023.005 $T_a = 25^\circ\text{C} (77^\circ\text{F})$	Min.	Typ.	Max.	Unit	Conditions
Continuous Current, I_F			15	mA	per segment, Dp
Pulse Current, I_{PP}			80	mA	$P_W = 1 \text{ ms}$ $D_F = 1/10$
Forward Voltage, V_F	1.8	1.9	2.4	V	$I_F = 15 \text{ mA}$
Blocking Voltage, BV_R			3	V	$I_R = 5.0 \mu\text{A max.}$
Light Intensity, I_V	0.04	0.11		mcd	$I_F = 5 \text{ mA}$
Power Drop (Loss), P_D			350	mW	7-Segm + Dp
Temperature-coefficient of V_F , C_{VF}		-2		mV/ $^\circ\text{C}$	
Ambient Temperature, T_a	-20		+75	$^\circ\text{C}$	

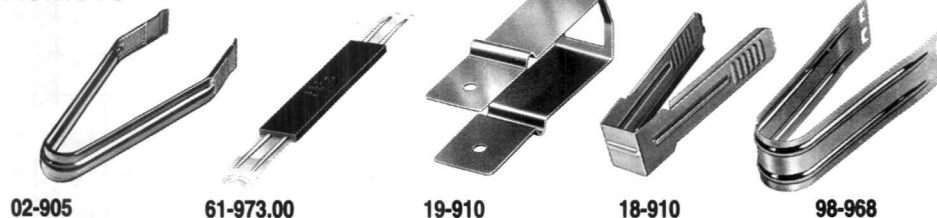


Dimensions & Mounting Information



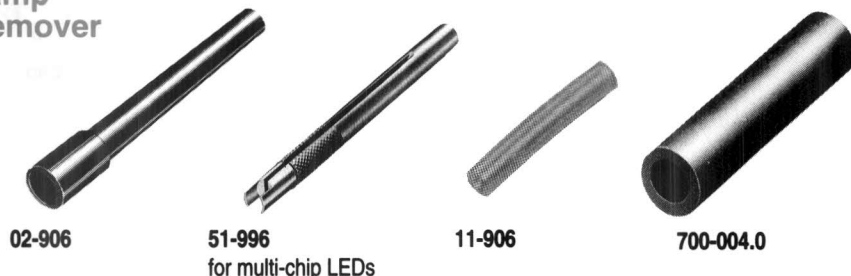
Accessories & Tools

Lens Remover



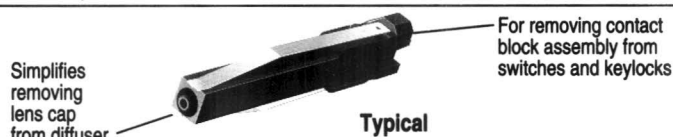
Series 01,02, 03, 22, 30, 31, 41, 51, 61:	02-905
Series 02, 03, (4-sided protection guard), 22, 61, 96, 98:	98-968
Series 18, 92 (IP 40):	18-910
Series 19, 97:	19-910
Series 61, 84:	61-973.00

Lamp Remover



Series 01, 02, 03, 14, 22, 30, 31, 41, 51, 52, 61, 99:	02-906
Series 04:	700-004.0
Series 11, 19, 97, 99:	11-906
Series 01, 02, 03, 14, 22, 30, 31, 41, 51, 52, 61:	51-996

Contact Block and Series 51/61 Lens Remover



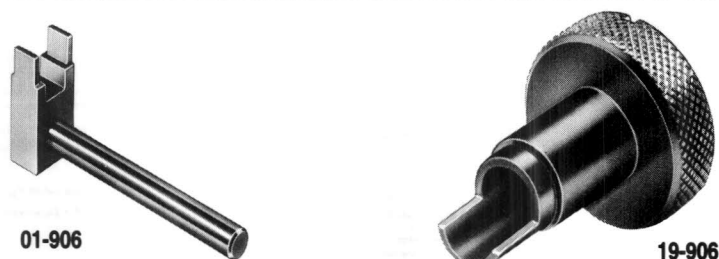
Series 31, 51, 52, 61*: *except for Series 61 24 x 24 mm	51-938
Series 22:	22-938

Mounting Wrench



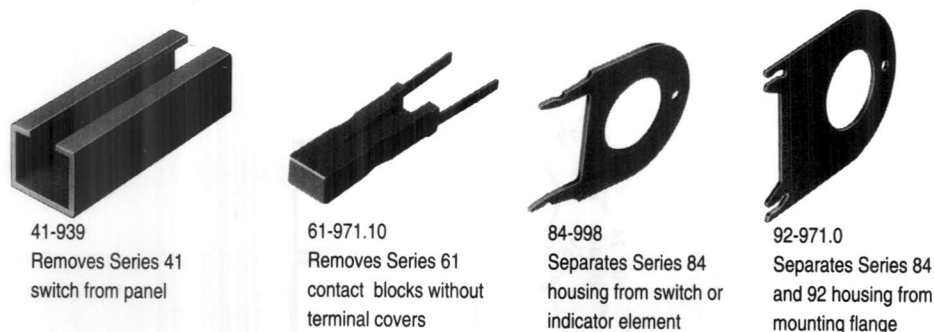
Series 01, 31, 32, 51, 52, 61, 85:	01-907
Series 11, 21:	11-905
Series 18, 19:	19-905
Series 04 (compact indicator):	700-005.0
Series 84:	84-997

Dressing Tool (prevents mounting misalignment)



Series 01, 31:	01-906
Series 19:	19-906

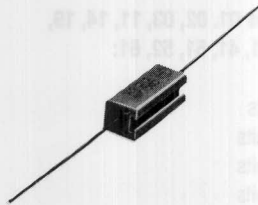
Dismantling Tool



Series 41:	41-939
Series 61:	61-971.10
Series 84:	84-998
Series 84, 92:	92-971.0

Accessories & Tools

Voltage Dropping Resistor



For 60 V, 20 mA Lamp

Series 01, 02, 03, 14, 22, 30, 31, 51, 52, 61:

110 V / 2.7 K Ω	02-904.0
125 V / 3.3 K Ω	02-904.1
145 V / 4.7 K Ω	02-904.3
220 V / 8.2 K Ω	02-904.6
240 V / 10 K Ω	02-904.7

For 48 V, 25 mA Lamp

Series 41:

110-125 V / 3.9 K Ω	02-904.2
220 V / 9.1 K Ω	41-969.9

For 36 V, 20 mA Lamp

Series 11, 19:

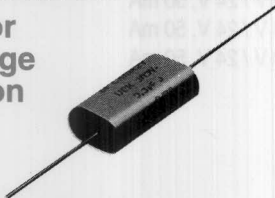
110-125 V / 3.9 K Ω	02-904.2
220 V / 10 K Ω	02-904.7

For 130 V, 20 mA Lamp

Series 04:

220 V / 5.6 K Ω	02-904.4
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Capacitor for Voltage Reduction



For 60 V, 20 mA Lamp, 220 V / 0.3 μ F

Series 01, 02, 03, 14, 22, 30, 31, 51, 52, 61: 02-917.0

Series 04: 700-003.0

For 48 V, 25 mA Lamp, 220 V / 0.3 μ F

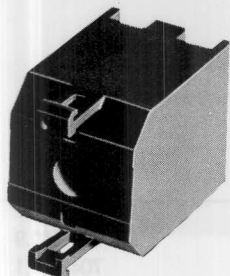
Series 41: 02-917.0

Resistor, Capacitor, Resistor-Diode, and Diode Blocks

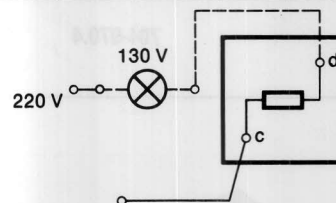
(Snap onto contact block or lamp holder)

Dimensions

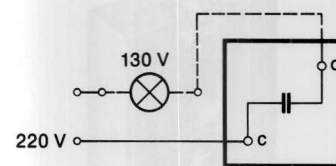
29.1 W x 28.4 L x 32.2 H mm
1.15 X 1.12 x 1.27



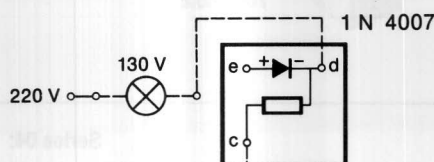
Resistor block



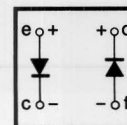
Capacitor block



Resistor-diode block



Diode block



Resistor Block
Series 04:

704-941.0

Capacitor Block
Series 04:

704-942.0

Resistor Diode Block
Series 04:

704-941.9

Diode Block
Series 04:

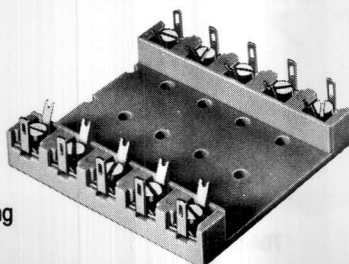
704-942.5

Terminal Panel

(For inserting resistors and capacitors)

Dimensions

60 mm wide
2.362
63/125/188/250 mm long
2.5/5.0/7.4/9.8



02-912.1

Series 01, 02, 03, 11, 14, 22, 19, 30, 31, 41, 51, 52, 61:

5 units	02-912.1
10 units	02-912.2
15 units	02-912.3
20 units	02-912.4

Accessories & Tools

Terminal Panel with Soldered Resistors

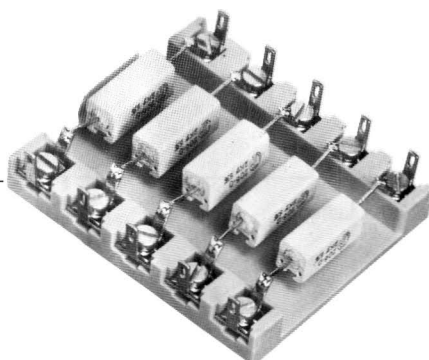
Indicate value: ☐

2.7 k Ω = 0

3.3 k Ω = 1

8.2 k Ω = 6

10.0 k Ω = 7



Series 01, 02, 03, 11, 14,
22, 19, 30, 31, 41, 51, 52, 61:

5 units	02-913.1 <input type="checkbox"/>
10 units	02-913.2 <input type="checkbox"/>
15 units	02-913.3 <input type="checkbox"/>
20 units	02-913.4 <input type="checkbox"/>

Terminal Panel with Soldered 0.3 μ F Capacitors

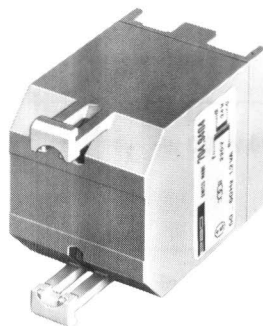
(230 V/60 V)

Series 01, 02, 03, 11, 14, 19,
30, 31, 41, 51, 52, 61:

5 units	02-914.10
10 units	02-914.20
15 units	02-914.30
20 units	02-914.40

Lamp Transformer

1.2 VA, 50/60 Hz
(Snap onto contact
block or lamp
holder)



Terminals are
recessed for
protection

Series 04:

115 V / 6 V, 200 mA	704-970.0
115 V / 24 V, 50 mA	704-970.3
230 V / 24 V, 50 mA	704-970.4
400 V / 24 V, 50 mA	704-970.5
440 V / 24 V, 50 mA	704-970.6

Dimensions

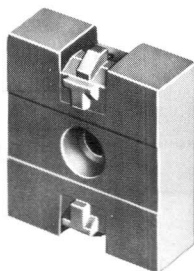
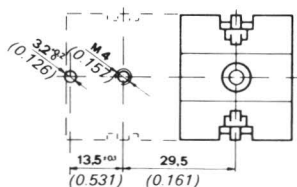
29.5 W x 46 L x 34 H mm

1.16 x 1.81 x 1.34

704-970.4

Mounting Plate

(For separate
mounting of
lamp transformer,
resistor or
capacitor block,
or flasher;
screw mounted)



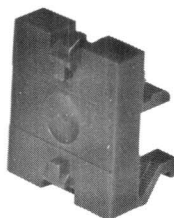
704-940.8

Series 04:

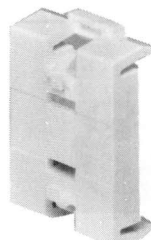
704-940.8

Mounting Plate

(For separate mounting of
lamp transformer, resistor
or capacitor block, or flasher;
bus-bar mounted per DIN 46277)



704-940.9



704-941.1

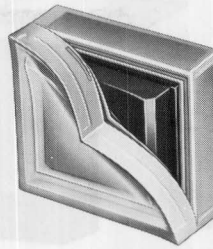
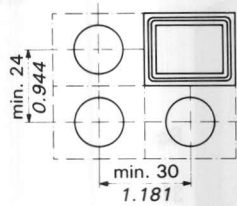
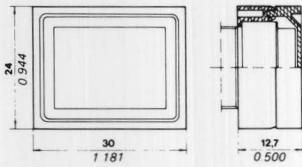
Series 04:

704-940.9
704-941.1

Accessories & Tools

Spray Cover

(Oil and water-tight. Meets IP65)

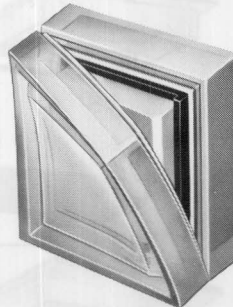
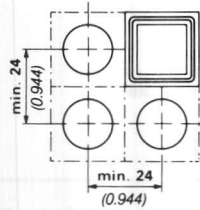
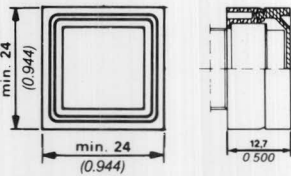


Rectangular

31-924.2 Silicone

Series 01, 31:

31-924.2

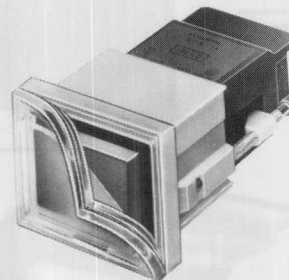
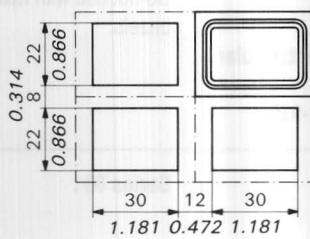
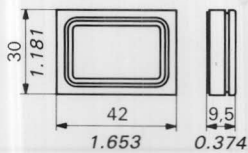


Square

31-923 PVC

Series 01, 31:

31-923



Rectangular

02-924 PVC
02-935 Silicone

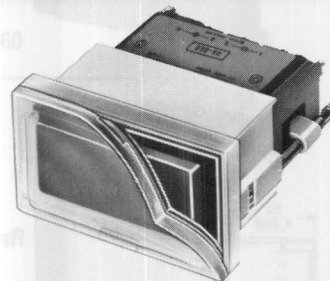
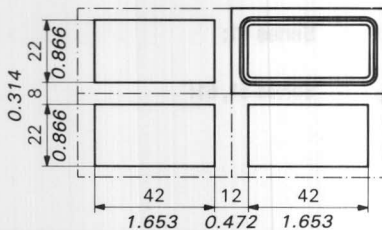
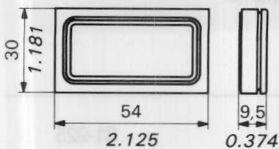
Series 02:

PVC
Silicone

02-924
02-935

PVC: -20°C to +60°C
(-4°F to +140°F)

Silicone: -25°C to +85°C
(-13°F to +185°F)



Rectangular

03-924 PVC

Series 03:

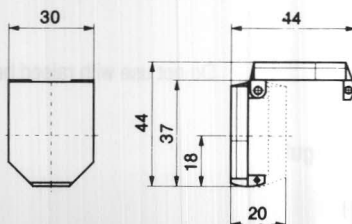
03-924

Do not use with split-lens 2-button
interlocked pushbuttons

Protection Cover

(For round bezels only.
Can be sealed)

To convert from
mm to inches:
multiply by 0.0394



704-925.0

Series 04, 14:

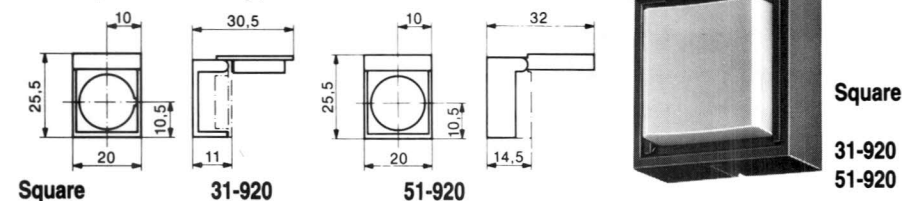
704-925.0

Accessories & Tools

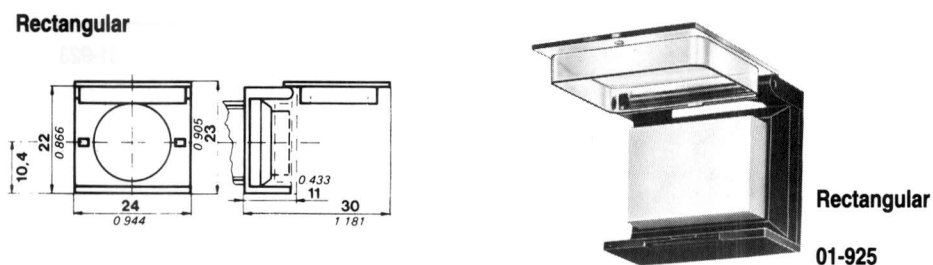
Protection Cover

(Protects against accidental operation.
Hinged, transparent cover
with security holes for locking.)

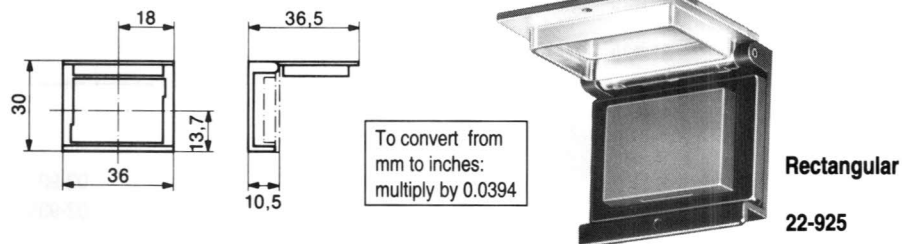
Series 01, 31:	31-920
Series 51, 61:	51-920



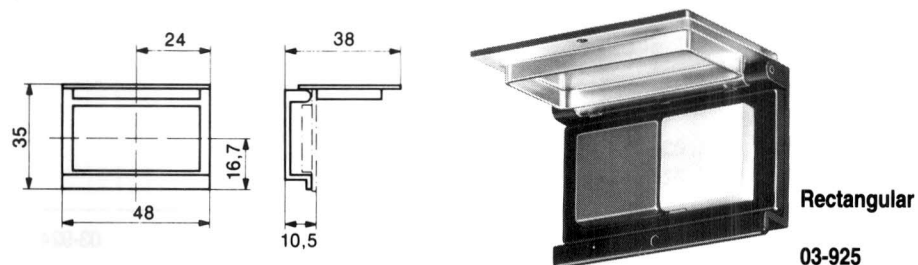
Series 01:	01-925
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Series 02 :	22-925
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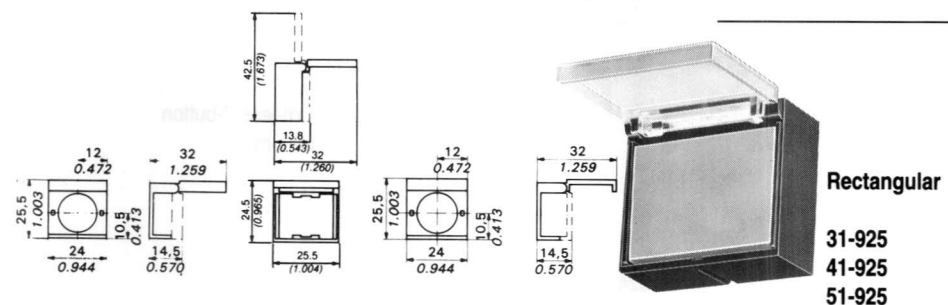
Series 03 :	03-925
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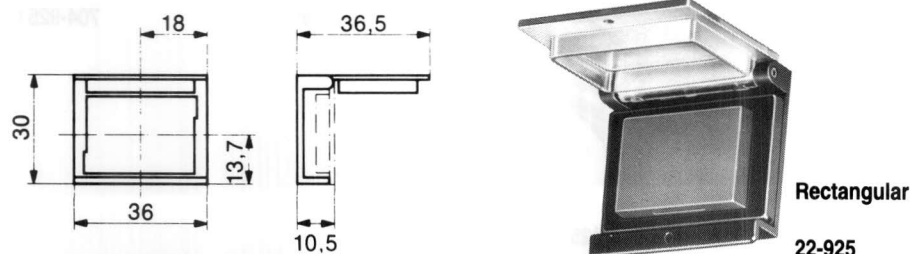
Series 31, 32:	31-925
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Series 41:	41-925
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Series 51, 61:	51-925
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Series 22:	22-925
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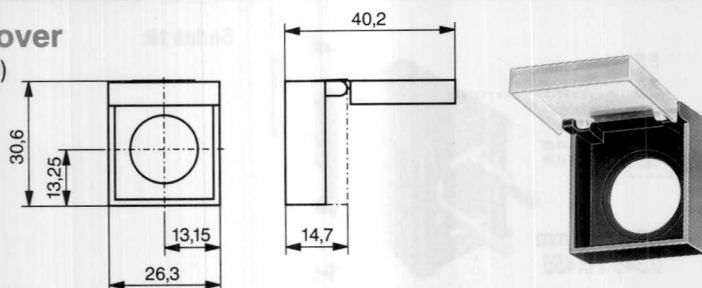


Accessories & Tools

Protection Cover

(For 24 x 24 mm bezel)

To convert from
mm to inches:
multiply by 0.0394

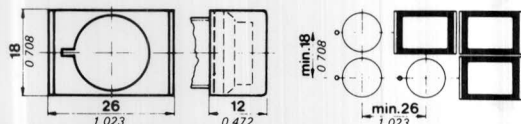


Series 61

61-992.00

Protection Guard

(Chrome plated)

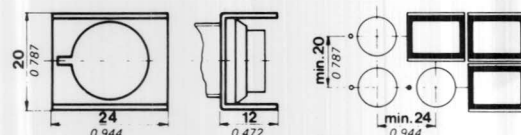


01-926

Rectangular
vertical
protection

Series 01, 31:

01-926



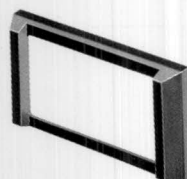
01-927

Rectangular
horizontal
protection

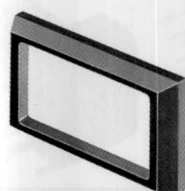
Series 01, 31:

01-927

Protection Guard



Two-sided raised



Four-sided raised

Series 02, 22: Two-sided raised 02-966.0
Series 02, 22: Four-sided raised 02-967.0

Series 03 Two-sided raised 03-966.0
Series 03 Four-sided raised 03-967.0

Panel Plug



Typical

Rectangular

	Black	Grey
Series 01, 31, 32:	01-947.0	01-947.8
Series 02:	02-949.0	02-949.8
Series 03:	03-949.0	03-949.8
Series 22:	22-949.0*	
Series 30:	30-947.0	
Series 41:	41-947.0	41-947.8
Series 51, 52, 61:	51-947.0*	
Series 61 (recessed):	61-945.20*	

Square

Series 01, 31, 32:	01-948.0	01-948.8
Series 04:	704-964.7	
Series 19, 97:	19-948.0	19-948.8
Series 51, 52, 61:	51-948.0*	
Series 61 (recessed):	61-945.10*	
Series 99:		99-948.8

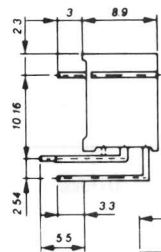
Round

Series 01, 31, 32:	01-949.0	01-949.8
Series 04, 14, 84:	704-960.7*	
Series 18, 19, 97:	19-949.0	19-949.8
Series 51, 52, 61:	51-949.0*	

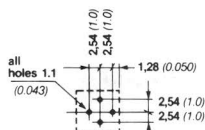
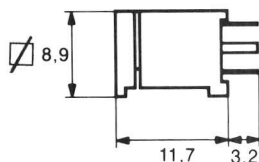
* Sealed to IP 65

Accessories & Tools

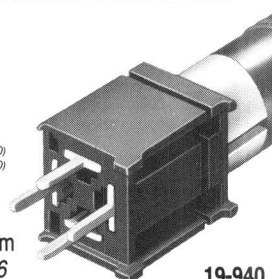
PC-Board Connector (For Series 19 only)



To convert from
mm to inches:
multiply by 0.0394



□ 8.8 x 11.6 mm
0.346 x 0.456

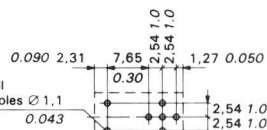


19-940

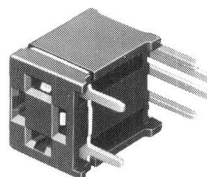
Series 19:

19-940

90° Connector



□ 8.88 x 15 mm
0.346 x 0.590

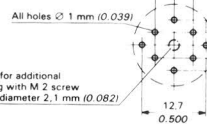
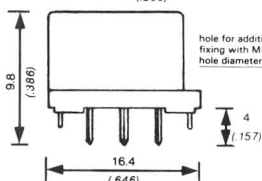


19-941

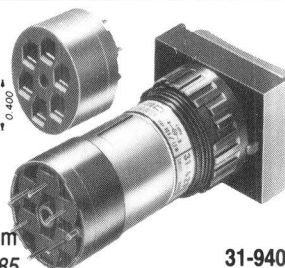
Series 19:

19-941

PC-Board Connector (For low-level switch elements)



□ 16.4 x 9.8 mm
0.645 x 0.385

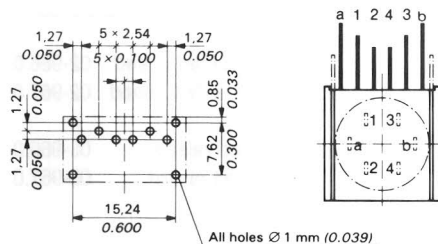


31-940

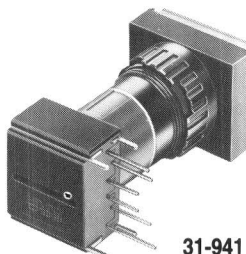
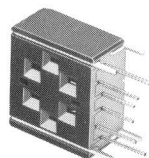
Series 01, 15, 11, 14, 21,
30, 31, 51, 52:

31-940

90° Connector



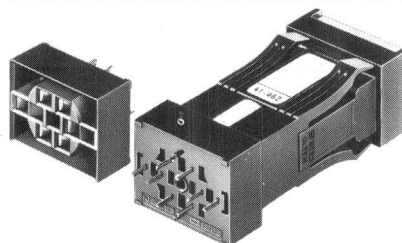
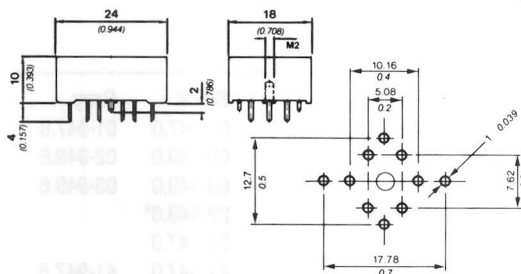
□ 17.9 x 8.4 mm
0.704 x 0.330



31-941

Series 11, 14, 15, 21, 30,
31, 51, 52:

31-941

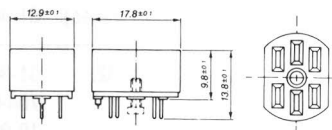


41-940

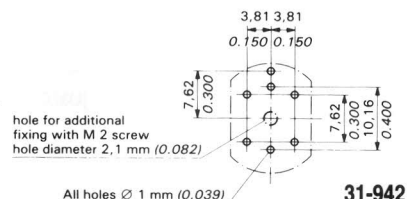
Series 41:

41-940

PC-Board Connector (For 0.110" Q.C. terminals, SPDT switch elements)



Pins: 0.9 x 0.3mm



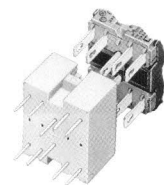
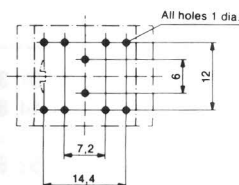
All holes 1 mm (0.039)

31-942

Series 01, 11, 14, 15, 30, 31,
32, 51, 52:

31-942

PC-Board Connector (For 0.110" Q.C. DPDT switch elements)



51-942

Series 31/51, 51, 52:

51-942

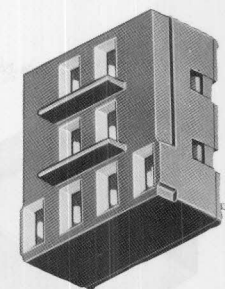
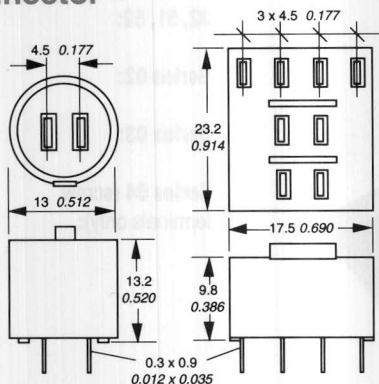
Accessories & Tools

PC-Board Connector

(For Series 61 quick connect contact block and standard indicator)



61-982.0 Indicator

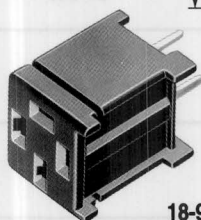


61-982.1 Contact block

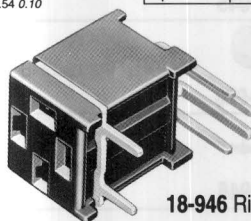
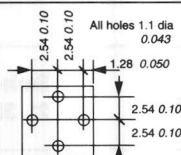
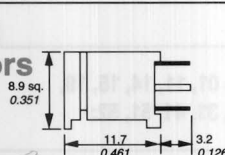
Series 61: 61-982.0

Series 61: 61-982.1

PC Board Connectors



18-945 Axial



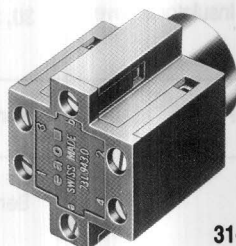
18-946 Right angle

Series 18: Axial
Right angle

18-945
18-946

Connector with Screw Terminals

(Connector mates with switch elements having Q.C. terminals 0.110 x 0.020." Screw terminals will accept 18 AWG wire or smaller.)



31-943.0

Series 01, 11, 14, 15, 31
32, 51, 52:

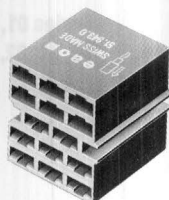
31-943.0

Multi-Connector Housing System For Direct Wiring

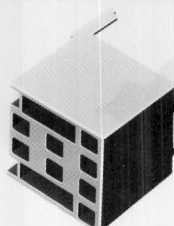
(For snap-action switch element)

Multi-Connector Housing

Uses flat connectors.
Maximum 6 connections.



51-943.0

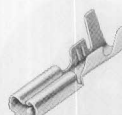


61-983.0

Series 51: 51-943.0
Series 61: 61-983.0

Flat Connector

for use in Multi-Connector Housing



51-943.1

Series 61: 51-943.1

Flat Connector Remover

For pulling flat connector out of Multi-Connector Housing

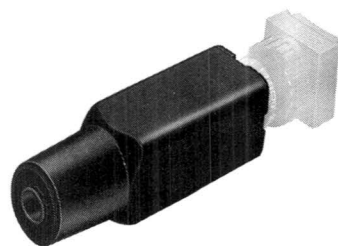


51-943.9

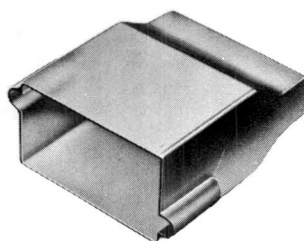
Series 61: 51-943.9

Accessories & Tools

Terminal Protection Cover



01-929



03-929

Series 01, 11, 14, 21, 31, 32, 51, 52:	01-929
Series 02:	02-929
Series 03:	03-929
Series 04 (screw terminals only):	704-964.5

Quick Connect Solderless Connectors



2.0 x 0.5 mm
0.079 x 0.020
terminals
(for low level
switches)



31-945

Female Tab

Series 01, 11, 14, 15, 19, 21, 30, 31, 41, 51, 52:	31-945
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31-928

Insulator Sleeve

Series 01, 11, 14, 15, 19, 21, 30, 31, 41, 51, 52:	31-928
--	--------

2.8 x 0.5 mm
0.110 x 0.020
terminals
(for snap action
switches)



31-946

Female Tab

Series 01, 11, 14, 15, 30, 31, 32, 51, 52, 61:	31-946
--	--------



31-929

Insulator Sleeve

Series 01, 11, 14, 15, 30, 31, 32, 51, 52, 61:	31-929
--	--------

2.8 x 0.8 mm
0.110 x 0.032

Female Tab

Series 84:	84-9420
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Quick Connect Terminals

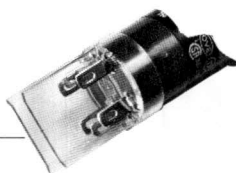
6.3 mm
0.25
(Install under screw terminals.
See Page 29 for mounting
and spacing dimensions)



0.250 inch tab

Series 04:	704-961.0
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Isolation Insert for 0.110 inch Terminals

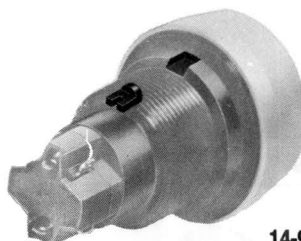
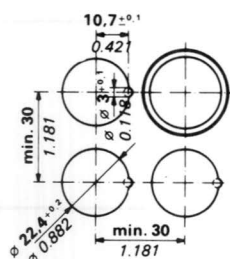


01-928

Series 01, 11, 14, 15, 30, 31, 32, 51, 52:	01-928
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Locating Fixture

(Anti-rotation insert)



14-910

Series 14:	14-910
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Fixing Screw

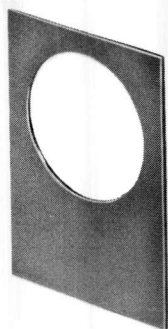
(DIN M1.2 x 5 mm)

Series 99:	99-990
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Accessories & Tools

Legend Plate

(Anodized aluminum)



Self adhesive

704-962.0 30 x 42 mm
1.18 x 1.65

704-962.5 42 x 42 mm
1.65 x 1.65
(self-adhesive)

Series 04, 14:

704-962.0
704-962.5

Legend Plate for 3-Position Keylock



31-998

Series 31, 51:

31-998

Emergency Stop Plate

Yellow



(Supplied with adhesive backing to seal against panel.)

Typical

Series 04 90 mm
60 mm

704-963.1
704-963.6

Reinforcement Plate

(For thin panels and plastic enclosures)



704-960.9

Series 04:

704-960.9

Reduction Ring



Typical

30.5 mm to 22.5 mm
(1.20 to 0.885 in.)
22.5 mm to 16 mm
(0.885 to 0.630 in.)
(Can only be used for Series 61 24 x 24 mm bezels)

Series 04, 14

704-960.8

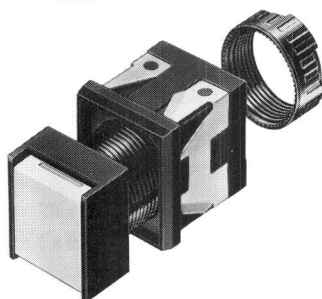
Series 61:

61-996.0

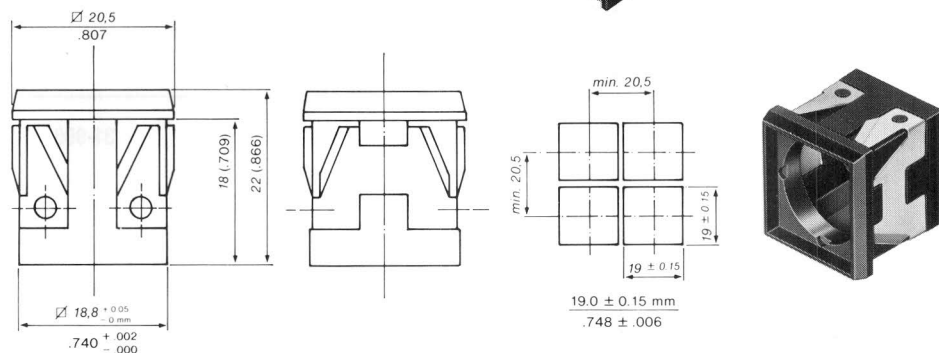
Accessories & Tools

Panel Cut-Out Adapters

(Converts rectangular or square cut-outs to round 16 mm panel holes)



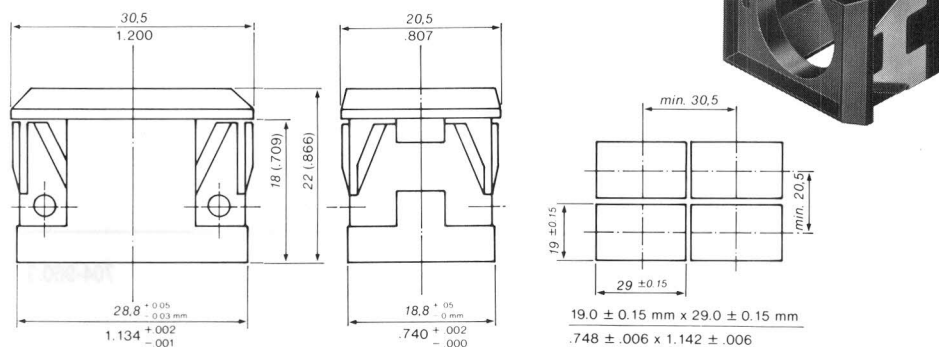
Series 01, 31, 32, 51, 52, 61: 31-948



Square 31-948

Rectangular 31-949

Series 01, 31, 32, 51, 52, 61: 31-949



Mounting Nut, Standard

Typical



Plastic

Series 01: 519-011.5

Series 31, 32, 51, 52, : 519-011.7

Metal

Series 15: 15-934
Series 19: 490-016.0
Series 31, 32, 51, 52: 31-991

Mounting Nut, Extended

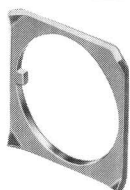


19-991

Series 18, 19: 19-991

Anti-Rotation Locking Washer

(Note: Refer to mounting section of Series 31/51, 32, 51, 52, and 61)



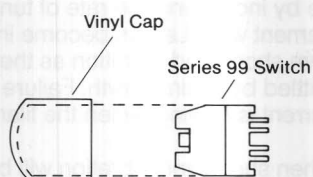
51-910

Series 31/51, 32, 51, 52, 61, 92: 51-910

Accessories & Tools

Vinyl Actuator Housing Cover

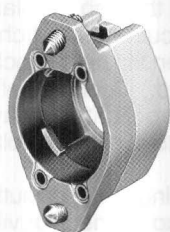
(Seals switch for flow soldering and washing operation)



Typical
99-924.9

Series 97:	97-924.0
Series 99:	99-924.9
Series 99: keylock	99-924.0

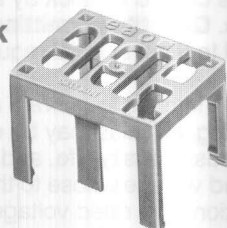
Metal Mounting Flange



704-960.5

Series 04:	704-960.5
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Terminal Cover for Series 61 Contact Block

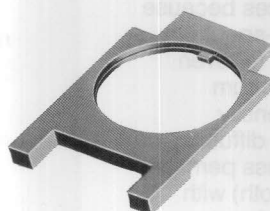
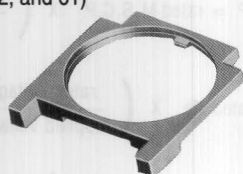


61-983.02

Series 61:	61-983.02
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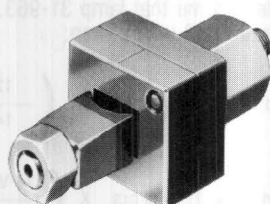
Aligning Insert

Aligns square and rectangular bezels. Use for Series 51, 52, and 61)



Series 61:	
18 x 24 bezel	61-991.0
18 x 18 bezel	61-991.1

Panel Punches

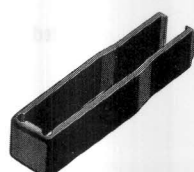


Typical

Series 02, 22:	02-999
Series 03:	03-999
Series 18:	18-999
Series 41:	41-999
Series 32, 51, 52, 61, 92:	51-999
Series 61 (recessed mounting):	
21 x 21 mm	61-999.8
21 x 27 mm	61-999.9
Series 84: round hole	84-999.1
Anti rotation ("double-D")	84-999.2

Mounting Tool

Helps install Series 61 contact block
(For contact blocks without terminal covers)



61-972.00

Series 61:	61-972.00
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Lamps & Legends

Light Sources

The following information presents a description of the various light sources available for EAO products and a guide to their selection.

- All EAO light sources in a socket can be relamped from the front panel for quick and easy replacement.
- All EAO light sources are stationary within the switch assembly. By avoiding lamp travel, operating life is materially increased.
- All EAO light sources are designed for even distribution, with no halo or hot spots.

Incandescent lamps, neon lamps, and LEDs (light emitting diodes) are available for most EAO switch products (see chart "Light Sources Available" for selection. These three types of light sources have distinctly different characteristics. Each must be matched with appropriate lenses and other accessories for best results.

EAO lighted devices offer the designer a wide range of appearance options. Colors can be vivid or subdued. Lenses and legends can change color when illuminated. Legends can be hidden, appearing only when lighted, or be split, with one part always visible, another part appearing only when lighted. Components and application techniques must be selected for the effect desired.

The following information is intended to help the designer choose the combination of light source, lens, lens holder or diffuser, film insert, color filter, etc. to best meet the needs of a particular application.

Incandescent Lamps

The miniature and subminiature incandescent lamp is the most widely used light source for illumination panel devices because of its great versatility. Its omnidirectional and broad-spectrum characteristics make its emissions readily diffusible for even illumination of relatively large areas. The broad spectrum permits filtering for attractive color effects. High intensity provides good brightness even after attenuation by diffusing and/or filtering materials. Good broad area brightness permits free use of legends (by engraving, film inserts, or both) with assured contrast for legibility. Finally, incandescent lamps are available for direct connection to most common system voltages and are inherently self-regulating when so used.

The less desirable characteristics of incandescent lamps are that they operate at relatively high current levels and generate considerable heat. Lamp filaments, unlike solid state semiconductor devices, must operate in a self-destructive mode to produce light. Service life, although often long, is limited.

The average life ratings published by lamp manufacturers (and included in the tables that follow) are based on tests performed under laboratory conditions: stable ambient temperature, no shock or vibration, filaments operated on AC voltage-regulated to $\pm 1\%$. Average life is the elapsed time after which 50% of the lamps under test have failed. Failure includes a current increase to 10% above the initial current value and/or a brightness decrease to 20% less than initial brightness.

Average lamp life may be shortened by as much as 50% when lamps are operated on DC, which accelerates grain growth of the tungsten filament, leading to earlier development of hot

spots. High ambient temperature (above 200°F) shortens lamp life by increasing the rate of tungsten migration away from the filament wire. Lamps become increasingly vulnerable to failure from shock and vibration as they age and filaments are embrittled by grain growth. Failure most often occurs while no current is flowing, when the filament is most brittle.

When shock and vibration will be present it is best to use a low-voltage lamp. Higher-voltage filaments are generally longer and smaller in diameter, with a great number of resonant points. Derating lamps (operating them at less than rated voltage) improves life by lowering filament temperature. Maintaining current through the filament keeps the filament more resilient than if current is switched off entirely, and minimizes cold tungsten filament shock. (Less than 1% of rated voltage is required.) Operation of lamps in constant current or series circuit applications may reduce lamp life by subjecting filaments to excessive voltage.

Operating the pushbutton of an EAO device does not subject the lamp to shock or vibration forces. The lamp is fixed, its socket being integral with the body of the device. Moving parts of the pushbutton are all isolated from the lamp.

Lamps carried in stock by EAO meet most common application needs. **Quantity permitting**, many other lamps can be obtained to meet special requirements. **Consult the factory.**

When a lamp is to operate at other than rated voltage, the following formulas may be used to predict the effects on luminous intensity, life, and current. The results are reliable for applied voltages close to the rated voltage. The further the deviation from rated voltage, the greater the percentage of error in the approximation.

Formulas to rerate lamps:

$$\text{rerated M.S.C.P.} = \text{rated M.S.C.P.} \times \left(\frac{\text{applied voltage}}{\text{rated voltage}} \right)^{3.5}$$

$$\text{rerated life} = \text{rated life} \times \left(\frac{\text{rated voltage}}{\text{applied voltage}} \right)^{12}$$

$$\text{rerated current} = \text{rated current} \times \left(\frac{\text{applied voltage}}{\text{rated voltage}} \right)^{.55}$$

For example assume that lamp 31-963.1, rated at 14 volts, is to be operated instead at 12 volts. Then:

$$\text{rerated M.S.C.P.} = .30 \text{ cd} \times \left(\frac{12 \text{ V.}}{14 \text{ V.}} \right)^{3.5} = .175 \text{ cd}$$

$$\text{rerated life} = 15,000 \text{ hrs} \times \left(\frac{14 \text{ V.}}{12 \text{ V.}} \right)^{12} = 95,380 \text{ hrs}$$

$$\text{rerated current} = .08 \text{ A.} \times \left(\frac{12 \text{ V.}}{14 \text{ V.}} \right)^{.55} = .073 \text{ A.}$$

Lamps & Legends

Neon Lamps

Neon lamps are low-current, long-life light sources limited by the high ionization voltage of neon (≥ 80 V) for use in line voltage circuits. Because the ionized gas holds a constant potential between lamp electrodes, a series resistor is required for current limiting. Larger lamps often include an integral resistor sized for a specific voltage.

Neon lamps glow with a low-intensity amber light, or green if the lamp is phosphor-coated. Bright light and vivid colors are not obtainable with neon lamps, but their typical 1.5 mA current drain, better than 25,000 hour service life, and good resistance to shock and vibration make them useful alternatives in many line voltage applications. For best visibility, they should be used with clear lenses and diffusers.

LIGHT SOURCES AVAILABLE														
Light Source	Pushbutton/Indicator Series													
	Instrument Grade										Heavy Duty			
	01	11	14	19	30	31	41	51/52/61	18/70/92/96,97	99	02	03	04	22
Incandescent	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
LED	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Neon lamp	✓		✓								✓	✓	✓	

Light Emitting Diodes

Solid-state LEDs operate at relatively low current levels and have virtually unlimited service life. Characteristics do not change significantly with age, and they are not easily damaged by shock or vibration. The light emitted, however, is of relatively low intensity. To offset this, instead of using the single chip concept in certain LED base configurations, we use a four or six chip configuration with a wide viewing angle and increased light intensity. Although not as intense as an incandescent lamp, multi-chip performance is very good, and should be adequate for many applications.

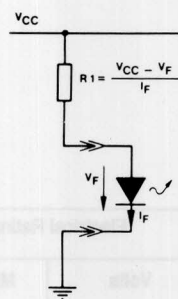
Another feature of multi-chip based LEDs is the inclusion of a built-in resistor to accommodate higher voltages without an external resistor. EAO stocks the common voltages of 6, 12, 24, and 48 volts, and are offered in red, green, and yellow.

The single chip LED is only used in our T-1 configuration. Due to small size, multi-chip design currently is not practical in T-1 size. However, since the T-1 normally is used in a confined space with a small lens, the high efficiency single-chip LEDs we use produce excellent results.

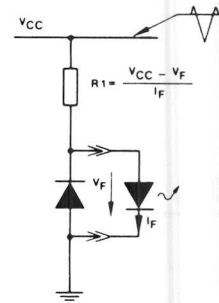
Current limiting and reverse polarity protection for LEDs can be provided by external LED control circuits. Typical techniques are shown in this section.

Selection of a proper lens can increase brightness. For example, the use of a transparent lens cap and transparent diffuser increases light output, and is usually needed for the larger lenses.

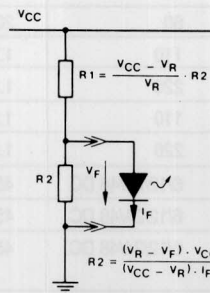
LED Protection Techniques



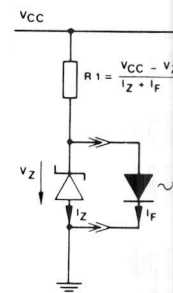
Supply voltage up to 5V DC



Supply voltage up to 5 V DC, LED protected against negative voltages and transients.



Supply voltage >5 V DC



Supply voltage >5 V DC, LED protected against negative voltages and transients.

V_F : Forward voltage
 V_R : Reverse voltage
 V_{CC} : Supply voltage
 V_Z : Zener voltage

I_Z : Zener current
 I_F : Forward current
 R1: Resistor 1/4 to 5 W
 R2: Resistor 1/4 W



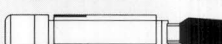
Lamps & Legends

The following four pages help users select illumination for each EAO switch series. They present data characterizing incandescent lamps, neons, and LEDs.

The tables indicate each switch series covered and include the following information:

- Illumination type and style of bulb
- Outline drawing of bulb
- General data including color and number of LED chips
- Electrical ratings: volts and milliamps
- Luminous intensity in mean spherical candle power (MSCP), millilumens (mlm), or millicandela (mcd)
- Average expected life in hours
- EAO part number

Series 01, 14 Illumination

Illumination Type	General Data	Electrical Ratings		Luminous Intensity	Average Life (hours)	Part Number
		Volts	Milliamps			
Incandescent** T-5.5, Slide Base 	Clear	6	200	0.33 MSCP	7,000	01-903.0
	Clear	12	100	0.26 MSCP	10,000	01-903.1
	Clear	24	50	0.27 MSCP	10,000	01-903.2
	Clear	30	40	0.29 MSCP	10,000	01-903.3
	Clear	36	37	0.20 MSCP	10,000	01-903.4
	Clear	48	25	0.21 MSCP	5,000	01-903.5
	Clear	60	20	0.16 MSCP	5,000	01-903.6
Neon, T-5.5 with integral resistor 	Amber	110	1.5	100 mlm	≥25,000	01-960.8
	Amber	220	1.5	100 mlm	≥25,000	01-960.9
	Green	110	1.5	100 mlm	≥25,000	01-961.8
	Green	220	1.5	100 mlm	≥25,000	01-961.9
Multi-chip LED, T-5.5 with integral resistor 	Red, 6-chip	6/12/24/48 DC	45/25/13/13	50 mcd	≥50,000	01-968. □ 2
	Yellow, 6-chip	6/12/24/48 DC	45/25/13/13	30 mcd	≥50,000	01-968. □ 4
	Green, 6-chip	6/12/24/48 DC	45/25/13/13	30 mcd	≥50,000	01-968. □ 5

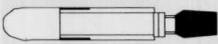
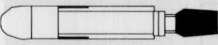
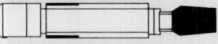
□ Select voltage:
1st digit is voltage: 0 = 6 V, 1 = 12 V, 2 = 24 V, 4 = 48 V (6-chip only)

* 24 V operation: Red = 50 mcd, Yellow = 15 mcd, Green = 30 mcd

** For higher voltages, use part no. 01-903.6 and dropping resistor or capacitor. (See page 84)

Lamps & Legends

Series 02, 03 Illumination

Illumination Type	General Data	Electrical Ratings		Luminous Intensity	Average Life (hours)	Part Number
		Volts	Milliamps			
Incandescent** T-6.8, Slide Base 	Clear	6	200	0.48 MSCP	10,000	02-903.0
	Clear	12	100	0.44 MSCP	10,000	02-903.1
	Clear	24	50	0.27 MSCP	10,000	02-903.2
	Clear	30	40	0.29 MSCP	10,000	02-903.3
	Clear	36	33	0.29 MSCP	10,000	02-903.4
	Clear	48	25	0.21 MSCP	5,000	02-903.5
	Clear	60	20	0.16 MSCP	5,000	02-903.6
Neon, T-6.8 with integral resistor 	Amber	110	1	60 mlm	≥25,000	02-960.8
	Amber	220	0.9	60 mlm	≥25,000	02-960.9
	Green	110	0.8	60 mlm	≥25,000	02-961.8
	Green	220	0.9	60 mlm	≥25,000	02-961.9
Multi-chip LED, T-6.8 with integral resistor 	Red, 6-chip	6/12/24/48 DC	45/25/13/13	50 mcd	≥50,000	02-963. <input type="checkbox"/> 2
	Yellow, 6-chip	6/12/24/48 DC	45/25/13/13	30 mcd	≥50,000	02-963. <input type="checkbox"/> 4
	Green, 6-chip	6/12/24/48 DC	45/25/13/13	30 mcd	≥50,000	02-963. <input type="checkbox"/> 5

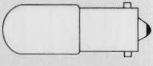
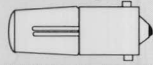
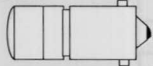
☐ Select voltage:

1st digit is voltage: 0 = 6 V, 1 = 12 V, 2 = 24 V, 4 = 48 V (6-chip only)

* 24 V operation: Red = 50 mcd, Yellow = 15 mcd, Green = 30 mcd

** For higher voltages, use part no. 01-903.6 and dropping resistor or capacitor. (See page 84)

Series 04 Illumination

Illumination Type	General Data	Electrical Ratings		Luminous Intensity	Average Life (hours)	Part Number
		Volts	Milliamps			
Incandescent T-3 1/4 bayonet base For higher voltages use lamp transformer or resistor/capacitor block. 	Clear	6	200	0.1 MSCP	5,000	700-000.0
	Clear	12	100	0.3 MSCP	5,000	700-000.1
	Clear	24	50	0.5 MSCP	5,000	700-000.2
	Clear	36	56	1.0 MSCP	5,000	700-000.3
	Clear	48	42	1.0 MSCP	5,000	700-000.4
	Clear	60	20	1.0 MSCP	5,000	700-000.5
	Clear	110	22	2.0 MSCP	5,000	700-000.6
	Clear	130	20	2.0 MSCP	20,000	700-000.7
Neon, T-3 1/4 with integral resistor 	Amber	110	1.5	100 mlm	≥25,000	700-001.0
	Amber	220	1.5	100 mlm	≥25,000	700-001.1
	Amber	380	1.5	100 mlm	≥25,000	700-001.2
Multi-chip LED, T-3 1/4 with integral resistor 	Red, 6-chip	6/15/24/48 DC	56/20/18/18	50 mcd	≥50,000	700-002. <input type="checkbox"/> 2
	Yellow, 6-chip	6/15/24/48 DC	56/20/18/18	30 mcd	≥50,000	700-002. <input type="checkbox"/> 4
	Green, 6-chip	6/15/24/48 DC	56/20/18/18	30 mcd	≥50,000	700-002. <input type="checkbox"/> 5

☐ Select voltage:




1st digit is voltage: 0 = 6 V, 1 = 15 V, 2 = 24 V, 4 = 48 V

Series 18 Illumination

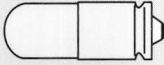
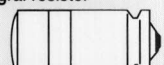
Illumination Type	General Data	Electrical Ratings		Luminous Intensity	Average Life (hours)	Integral Lens and LED Part Number		
		Volts	Milliamps			Rectangular	Square	Round
LED, High intensity LED is part of the Series 18 illuminated lens	Red	2.0 DC	21	1200 mcd	≥50,000	18-941.2	18-951.2	18-931.2
	Yellow	2.2 DC	21	1400 mcd	≥50,000	18-841.4	18-951.4	18-931.4
	Green	2.2 DC	23	320 mcd	≥50,000	18-941.5	18-951.5	18-931.5

Lamps & Legends

Series 11, 19, 21, 99 Illumination

Illumination Type	General Data	Electrical Ratings		Luminous Intensity	Average Life (hours)	Part Number
		Volts	Milliamps			
Incandescent T-1, Bi-Pin 	Clear	6	115	0.15 MSCP	40,000	11-903.0
	Clear	12	60	0.15 MSCP	16,000	11-903.1
	Clear	18	26	0.15 MSCP	16,000	11-903.2
	Clear	24	24	0.15 MSCP	16,000	11-903.3
	Clear	28	24	0.15 MSCP	16,000	11-903.4
LED T-1, Bi-Pin 	Red	1.7 DC	20	30 mcd	≥50,000	99-943.02
	Yellow	2.1 DC	20	20 mcd	≥50,000	99-943.04
	Green	2.1 DC	20	10 mcd	≥50,000	99-943.05
Multi-chip LED, T-1 bi-pin 	Red, 4-chip	28 DC	12	6 mcd	≥50,000	11-968.32
	Orange, 4-chip	28 DC	12	6 mcd	≥50,000	11-968.33
	Yellow, 4-chip	28 DC	12	12 mcd	≥50,000	11-968.34
	Green, 4-chip	28 DC	12	18 mcd	≥50,000	11-968.35

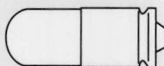
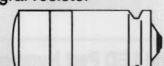
Series 22, 30, 31, 51, 52, 61 Illumination

Illumination Type	General Data	Electrical Ratings		Luminous Intensity	Average Life (hours)	Part Number
		Volts	Milliamps			
Incandescent** T-1¾, Midget Groove Base 	Clear	6.3	200	0.40 MSCP	20,000	31-963.0
	Clear	14	80	0.30 MSCP	15,000	31-963.1
	Clear	28	40	0.30 MSCP	7,000	31-963.2
	Clear	48	25	0.20 MSCP	5,000	31-963.3
	Clear	60	20	0.15 MSCP	5,000	31-963.4
Multi-chip LED, T-1¾ with integral resistor 	Red, 6-chip	6/12/24/48 DC	45/25/13/13	50 mcd	≥50,000	31-968. □ 2
	Yellow, 6-chip	6/12/24/48 DC	45/25/13/13	30 mcd	≥50,000	31-968. □ 4
	Green, 6-chip	6/12/24/48 DC	45/25/13/13	30 mcd	≥50,000	31-968. □ 5

□ Select voltage:
1st digit is voltage: 0 = 6 V, 1 = 12 V, 2 = 24 V, 4 = 48 V (6-chip only)

** For higher voltages, use part no. 31-963.4 and dropping resistor or capacitor.

Series 41 Illumination

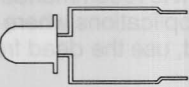
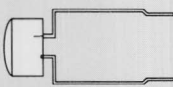
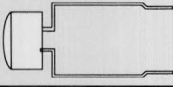
Illumination Type	General Data	Electrical Ratings		Luminous Intensity	Average Life (hours)	Part Number
		Volts	Milliamps			
Incandescent** T-1¾, Midget Groove Base 	Clear	6	125	0.35 MSCP	10,000	41-963.0
	Clear	12	75	0.20 MSCP	10,000	41-963.1
	Clear	18	40	0.20 MSCP	5,000	41-963.2
	Clear	24	35	0.20 MSCP	5,000	41-963.3
	Clear	28	30	0.30 MSCP	5,000	41-963.4
	Clear	48	20	0.20 MSCP	5,000	41-963.5
Multi-chip LED, T-1¾ with integral resistor 	Red, 6-chip	6/12/24/48 DC	45/25/13/13	50 mcd	≥50,000	31-968. □ 2
	Yellow, 6-chip	6/12/24/48 DC	45/25/13/13	30 mcd	≥50,000	31-968. □ 4
	Green, 6-chip	6/12/24/48 DC	45/25/13/13	30 mcd	≥50,000	31-968. □ 5

□ Select voltage:
1st digit is voltage: 0 = 6 V, 1 = 12 V, 2 = 24 V, 4 = 48 V (6-chip only)

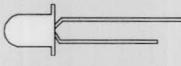
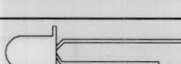
** For higher voltages, use part no. 31-963.4 and dropping resistor or capacitor. (See page 84)

Lamps & Legends

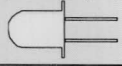
Series 84, 92 Illumination

Illumination Type	General Data	Electrical Ratings		Luminous Intensity	Average Life (hours)	Part Number
		Volts	Milliamps			
LED, T-1 Bi-Pin 	Red	2.2 DC	20	25 mcd	≥50,000	92-948.2
	Orange	2.2 DC	20	25 mcd	≥50,000	92-948.3
	Yellow	2.2 DC	20	35 mcd	≥50,000	92-948.4
	Green	2.2 DC	20	20 mcd	≥50,000	92-948.5
LED, T-1, Multi-Chip 	Red	13.2 DC	20	45 mcd	≥50,000	92-945.2
	Orange	13.2 DC	20	50 mcd	≥50,000	92-945.3
	Yellow	13.2 DC	20	135 mcd	≥50,000	92-945.4
	Green	13.2 DC	20	30 mcd	≥50,000	92-945.5
LED, T-1, Multi-Chip, Bi-Color 	Red/Green	12 DC with external resistors	20	45/30 mcd	≥50,000	92-945.2/5
Incandescent This filament lamp has dimensions and leads that are identical to the bi-pin and multichip LEDs	Clear	24 DC	20	80 mcd	4,000	92-946.30

Series 96 Illumination

Illumination Type LED, T-1, Bi-Pin	General Data	Electrical Ratings		Luminous Intensity	Average Life (hours)	Part Number
		Volts	Milliamps			
 Standard—leads not cut	Red	2.0 DC	20	3.5 mcd	≥50,000	98-843.021
	Yellow	2.0 DC	20	2.5 mcd	≥50,000	98-843.041
	Green	2.0 DC	20	1.7 mcd	≥50,000	98-843.051
 Leads cut to proper length with special form to lock in position	Red	2.0 DC	20	3.5 mcd	≥50,000	98-843.022
	Yellow	2.0 DC	20	2.5 mcd	≥50,000	98-843.042
	Green	2.0 DC	20	1.7 mcd	≥50,000	98-843.052
 Leads formed for A & D holes	Red	2.0 DC	20	3.5 mcd	≥50,000	98-843.023
	Yellow	2.0 DC	20	2.5 mcd	≥50,000	98-843.043
	Green	2.0 DC	20	1.7 mcd	≥50,000	98-843.053
 Leads cut for Euro-style key caps	Red	2.0 DC	20	3.5 mcd	≥50,000	96-848.21
	Yellow	2.0 DC	20	2.5 mcd	≥50,000	96-848.41
	Green	2.0 DC	20	1.7 mcd	≥50,000	96-848.51

Series 97 Illumination

Illumination Type	General Data	Electrical Ratings		Luminous Intensity	Average Life (hours)	Part Number
		Volts	Milliamps			
LED, T-1, Bi-Pin High-intensity, wide angle 	Red	2.2 DC	20	25 mcd	≥50,000	97-946.02
	Orange	2.2 DC	20	25 mcd	≥50,000	97-946.03
	Yellow	2.2 DC	20	35 mcd	≥50,000	97-946.04
	Green	2.2 DC	20	20 mcd	≥50,000	97-946.05

Lamps & Legends

Legend & Illumination Techniques

General. The great variety of legend and illumination effects obtainable with EAO devices includes not only the choice of light source, but also lens and legend style selection. While details vary from series to series, the lens system generally consists of two parts: 1. the lens cap and 2. a diffuser or lens holder that usually are combined under one part number.

Illumination effects depend on the following component choices:

1. Lighting Device

- Incandescent lamp
- LED
- Neon lamp

2. Lens Cap

- Color
- Transparent or translucent

Diffuser

- Color
- Translucent or clear

Legends are usually produced by engraving on the lens or diffuser surface, or films can be inserted between the lens cap and the diffuser.

Intensity changes when illuminated. This most common effect is obtained by using any colored lens and is called transmitted color.

More vivid color change effects can be created by using a Solar Black lens. When unlit, this lens appears to be opaque black and will conceal a colored film insert or film holder behind it. When the lamp lights, however, the lens becomes illuminated and visible.

Visible legend: background lights. This effect can be obtained with any lens by having the legend engraved into the lens and filled with contrasting ink. Where heavy pushbutton use might wear off an engraving, the legend can instead be engraved and filled on the diffuser. As an alternative to engraving, a film positive insert can be used between a transparent lens and a translucent backing element.

Visible legend: background color changes when lighted.

For this effect, use a clear lens, a film positive insert, a translucent white backing element, and a color filter boot on the lamp. This is called projected color.

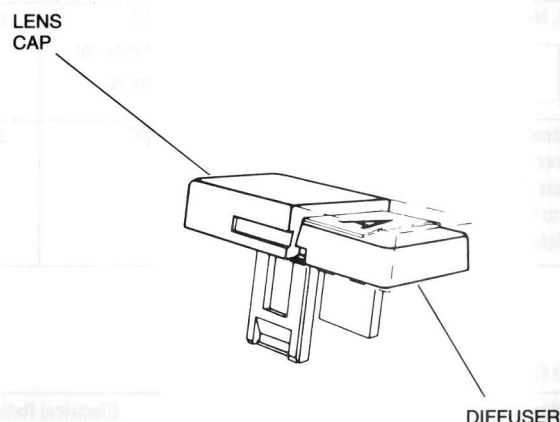
Dead front: legend appears only when illuminated. With a translucent lens, this can be done by engraving and filling the legend on the backing element, or by using a film insert (positive for lighted background, negative for lighted legend). It can also be obtained using a Solar Black lens with a film insert and white or colored backing element.

Other effects. Combined visible/hidden legend effects can be achieved by engraving the visible portion on a translucent or Solar Black lens and the hidden portion on the backing element. For phototypes and low-volume projects, transfer lettering and transparent color films available at art supply shops may be useful additions to the lenses, accessories, and services offered by EAO.

Film Legends

A film, either black and white or color, may be inserted between the lens cap and diffuser. To prepare the lens for film, simply press the diffuser legs together and remove the lens cap. Film then may be placed on the diffuser and the cap snapped back into its original position. When using film, it is recommended that a transparent lens cap be used. In applications where the legend is to appear only when illuminated, use the dead front technique.

Typical film application



Color Filter Boots

Color filter boots are made from silicon rubber material and fit over the specific lamp. The effect of using a colored filter boot is to project the color of the boot onto the lens area. Used with a translucent white lens or a clear lens, this technique presents a change from a white indication when unlighted to a pleasing pastel colored glow when illuminated. A second advantage of using a color filter boot is an increase in lamp life by 5-6 percent because the boot acts as a heat sink.

Description	Color	T-1 ³ / ₄	T-3 ¹ / ₄
		Part No.	Part No.
Flexible color filter boots for incandescent lamps	Red	31-102	704-102
	Orange	31-103	704-103
	Yellow	31-104	704-104
	Green	31-105	704-105
	Blue	31-106	704-106
	White correcting blue	31-109	704-109

Lamps & Legends

Film thickness: 0.2 mm (0.008) except Series 92: See below

Series	Rectangular	Square
01	10.2 x 16.2 mm (0.401 x 0.637)	10.2 x 10.2 mm (0.401 x 0.401)
02	22.4 x 13.4 mm (0.881 x 0.527)	
03	34.3 x 14.3 mm (1.35 x 0.562) 15.6 x 14.3 mm (0.614 x 0.562)	
04		21.4 x 21.4 mm (0.843 x 0.843)
22	22.4 x 13.4 mm (0.881 x 0.527)	
30	12.7 x 18.7 mm (0.500 x 0.736)	
31	12.7 x 18.7 mm (0.500 x 0.736)	12.7 x 12.7 mm (0.500 x 0.500)

Series	Rectangular	Square
41	12.7 x 18.7 mm (0.500 x 0.736)	
51	12.7 x 18.7 mm (0.500 x 0.736)	12.7 x 12.7 mm (0.500 x 0.500)
61	12.7 x 18.7 mm (0.500 x 0.736) Overhanging lens 11.9 x 18 mm (0.469 x 0.709)	12.7 x 12.7 mm (0.500 x 0.500) 16.9 x 16.9 mm (0.666 x 0.666) 11.9 x 11.9 mm (0.469 x 0.469)
85	12.7 x 18.7 mm (0.500 x 0.736)	
96	7 x 12 mm (0.276 x 0.472)	
92		For IP 67 13.3 x 13.3 mm (0.524 x 0.524) thickness: 0.1 mm For IP 40 11.4 x 11.4 mm (0.449 x 0.449) thickness: 0.2 mm
99	Single: 16 x 16 mm (0.629 x 0.629) Double: 16 x 34.7 mm (0.629 x 1.37) Triple: 16 x 53.8 mm (0.629 x 2.12)	

Series 92 Legends

Series 92 pushbuttons and indicators can be obtained with a legend or symbol. A drawing or artwork is required. IP 40 actuators are engraved on the lens surface. IP 67 actuators are engraved on the legend plate.

The standard stroke thickness is 0.5 mm (0.020").

Legends are filled with a special hard enamel paint. Red, blue, green, black, and gray colored lenses are filled with white paint. All other color lenses are filled with black paint.

Film legends may be used. The film should be as specified in the above chart. Consult factory for details. When removing membrane caps to insert film, tool 92-998 must be used to assure proper installation.

Laser and pad printing are also available when large quantities are required. Cost savings are substantial, but these techniques require high costs for initial set-up.

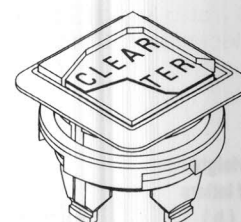
Any special symbols will require a one-time charge for producing plates or appropriate computer programming.

Height of letters (mm)	No. of lines	Letters per line (capitals)
2.5	3	6-7
3	2	5-6
4	2	4
5	1	3
6	1	2-3
8	1	2



Engraving

Note: IP 67 actuators with opaque lens caps cannot be marked



Film Inserts

See film size chart for specifications

Custom Legends

Use Code 99 to order custom legends



6 mm (0.236")

For symbols with an individual figure



2.5 mm (0.099")

For symbols up to a max. of 7 figures in line



Legends will be oriented with mounting hole key position shown

Lamps & Legends

Legend & Engraving Information

Engraved Legends

Legends are engraved on the front surface of the lens cap and ink filled. Red, blue, green, black, and gray colored lens caps are filled with white ink. All other colors are filled with black ink.

Engraving type is condensed gothic, with standard 0.125" by 0.020" stroke.

Legend Arrangements

How to Order Engraved Legends

Clearly identify legends requirement, as a separate item, using the following instructions:

Commas* denote a separate line of engraving.

A slash* denotes a separate lens section or division.

(* When comma/slash are part of engraving, indicate by separate note.)

Example 1: Lens
Part No. 01-901
Engraving: READ, OUT

READ
OUT

Example 2: Lens
Part No. 03-902
Engraving: BRIDGE, LIGHTS,
ON/BRIDGE, LIGHTS, OFF

BRIDGE
LIGHTS
ON

BRIDGE
LIGHTS
OFF

Series	Rectangular			Vertical			Round			Square			Split Rect. (R) Vert. (V) Sections		
	Lens Part No.	Max. No. of	Max. No. of	Lens Part No.	Max. No. of	Max. No. of	Lens Part No.	Max. No. of	Max. No. of	Lens Part No.	Max. No. of	Max. No. of	Lens Part No.	Max. No. of	Max. No. of
		Lines	Letters		Lines	Letters		Lines	Letters		Lines	Letters		Lines	Letters
01	01-901	2	7	01-901	4	4	01-931	2	5	01-951	2	4			
02/22	02-901	3	10	02-901 02-902	4	7									
03	03-901 03-941	4	16	03-901 03-941	8	6							03-902 03-943	3	6
04							704-608.9 704-609.9	3 3	9 7	704-708.9 704-709.9	4 4	9 8			
14							See Series 04								
18, 19	Pushbuttons and indicators can be engraved. Please contact factory														
30	See Series 31														
31	31-901	3	8	31-901	4	5	31-931	2	5	31-951	3	5			
41	See Series 31												41-903 41-907	4 2	3(R) 5(V)
51	51-901	3	8	51-901	4	5	51-931	2	5	51-951	3	5			
61 Std.	61-923.1	3	8	61-923.1	4	5	61-921.1	2	5	61-922.1	3	5	(Large Sq. 61-925.1, 3 lines, 7 letters)		
Overhang. lens	61-928.1	3	9	61-928.1	4	6				61-927.1	3	6			
92										92-95	3	7			
99	99-963 99-968	3 3	16 25							99-908	3	6			

Series 96

Film Legends: A key cap is available for the insertion of a film or color patch. Film dimensions are 7 x 12 x 0.2 mm (0.275 x 0.472 x 0.007 inches)

Height of letters (h)	12.4 0.488		14.8 0.582		17.4 0.685	
	No. of lines	Letters per line	No. of lines	Letters per line	No. of lines	Letters per line
2.5 (0.098)	2	5	2	6	2	7-8
3 (0.118)	2	4	2	5	2	6-7
4 (0.157)	1	3-4	1	4	1	4-5
5 (0.196)	1	2-3	1	3	1	3-4
6 (0.236)	1	2	1	2-3	1	2-3
8 (0.314)	1	1	1	1-2	1	2

NOTE:
Contact factory for
Series 84 legend
requirements

Lamps & Legends

Legends and ISO-Symbols for Series 04

Legends and ISO-Symbols are hot stamped on Series 04 and Series 14 diffusers or Series 04 square film. The following part numbers will indicate the component for requesting legends or ISO-Symbols.

Component for Legend or ISO-Symbol	Part Number
Indicator — round diffuser	704-608.9
Indicator — round knurled diffuser	704-608.7
Pushbutton — round diffuser	704-609.9
Pushbutton — round knurled diffuser	704-609.7
Pushbutton — round extended diffuser	704-610.9
Pushbutton — round knurled extended diffuser	704-610.7
Indicator — square diffuser	704-708.9
Indicator — square film	704-706.7
Pushbutton — square diffuser	704-709.9
Pushbutton — square film	704-707.7

When ordering a legend or ISO-Symbol to be part of the above part numbers, please order as follows:

Example 1: 704-608.9 Legend 1

Example 2: 704-706.7 ISO-8

Example 3: 704-707.7 Legend 15

Example 4: 704-609.9 ISO-27

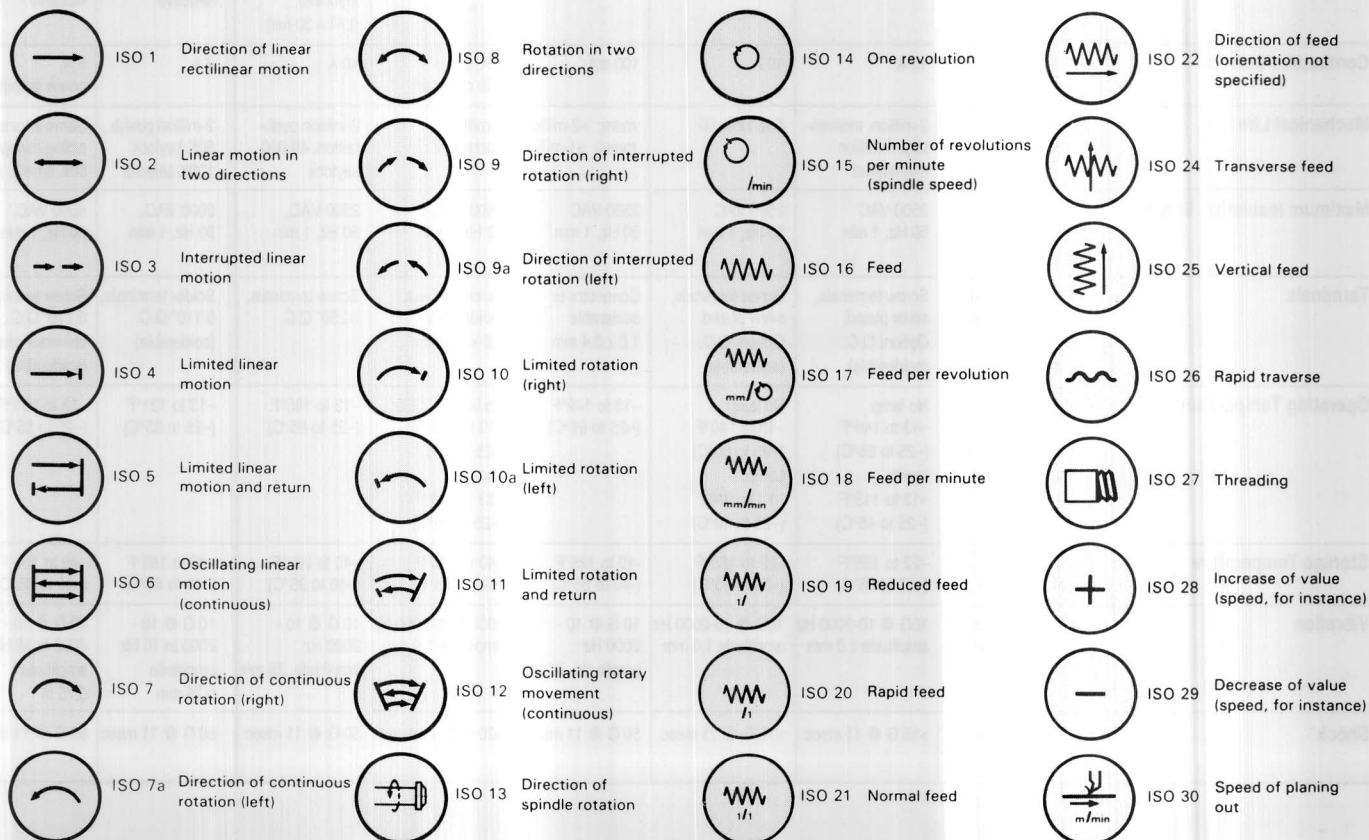
We carry a large stock of the above components but to assure proper delivery, please allow 6-8 weeks for selected legends or ISO-Symbols to be hot stamped

Standard Legends



ISO-Symbols

Here is a selection of commonly used ISO-Symbols. We can supply any symbol desired.



Technical Information

Switching Element	Snap Action							
	Available in Series Number:	01/11/14/15/21/30 31/32/41/51/52	02/03	04	18	19	22	61
								snap-action slow make
Switch configuration	1 Form Z double break element per contact block	Form C	Form A or Form B double break element	1 N.O. or 1 N.C.	1 N.O.	Max. 2PST N.O. or N.C.	Max. 3PST N.O. or N.C.	Max. 2PST N.O. or N.C.
Mode	Momentary or maintained, 1 to 4 poles	Momentary or maintained, 1 or 2 poles	Momentary or maintained, 1 or 2 poles	Momentary or maintained	Momentary or maintained	Momentary or maintained, 1 or 2 poles	Momentary or maintained, 1, 2, or 3 poles	Momentary or maintained, 1, 2, or 3 poles
Contact Material	10 microns gold over silver or silver contacts	Silver standard, gold over silver or silver over palladium (opt.)	Silver standard, gold over silver or silver over palladium (opt.)	Gold on nickel plating	Silver or gold over silver	Hard silver	Silver or gold over silver	Silver or gold
Contact Resistance			<50 mΩ in new state	<100 mΩ in new state		≤50 mΩ in new state	≤50 mΩ in new state	≤50 mΩ in new state
Contact Bounce			≤3 msec	≤2.5 msec		≤3 msec	≤1 msec	≤2 msec
Lens Travel	0.118" (3 mm)	0.196" (5 mm)	0.228" (5.8 mm)	0.087" (2.2 mm)	0.106" (2.7 mm)	0.216" (5.5 mm)	0.118" (3 mm)	Illum. PB: 3 mm Emerg. PB: 10 mm
Operating Force (on lens) Force may vary depending on number of contacts.	200-550 grams (2-5.5 N)	600-1200 grams (6-12 N)	1100-2200 grams (11-22 N) snap action 1300-4800 grams (14-48 N) slow make	140 grams (1.4 N)	160 grams (1.6 N)	1 Pole: 360 g ± 30 g (3.6 N ± 0.3 N) 2 Pole: 680 g ± 30 g (6.8 N ± 0.3 N)	270-360 grams (2.7-3.6 N)	350-1100 grams (3.5-11 N) Emergency stop: 3000-5000 grams (30-50 N)
Rating, AC	250 V/5 A P.F. = 1 250 V/3 A P.F. = 0.3	380 V/10 A P.F. = 0.3 UL listed: 250 V/10 A	UL listed: 500 V/10 A SEV listed: 600 V/10 A	100 μV/10 μA to 42 V/100 mA	50 V/1 A, silver 50 V/100 mA, gold	380 V/10 A P.F. = 1 minimum 12 V AC/50 mA	See Note ②	See Note ③
Rating, DC	220 V/0.1 A 24 V/2 A	220 V/0.2 A 24 V/6 A	220 V/0.5 A 24 V/10 A	100 μV/10 μA to 42 V/100 mA	72 V/1 A, silver 72 V/100 mA, gold	220 V/0.2 A 24 V/6 A inductive (L/R = 30 ms)	220 V/0.5 A 24 V/6 A resistive	240 V/0.5 A 24 V/6 A resistive
Continuous Current	5 A	10 A	10 A	100 mA	1 A, silver 100 mA, gold	10 A	6 A	5 A, screw terminals
Mechanical Life	2-million operations	2-million, momentary, 1-million maintained	See Note ①	mom: >2-million maint: >1-million	2-million operations	2-million push-button, 40,000 keylock	2-million pushb., 50K keylock, 100K selector	Same as snap-acting except 50K emerg. pushb.
Maximum Insulation Voltage	2500 VAC 50 Hz, 1 min	2500 VAC 50 Hz, 1 min	2500 VAC 50 Hz, 1 min	2500 VAC 50 Hz, 1 min	2500 VAC 50 Hz, 1 min	2500 VAC, 50 Hz, 1 min	2000 VAC, 50 Hz, 1 min	4000 VAC, 50 Hz, 1 min
Terminals	Solder terminals, gold plated and 0.110" Q.C. (solderable)	Screw terminals, silver plated. Option: Q.C. (solderable)	Screw terminals, silver plated. Option: Q.C. (solderable)	Connector or solderable 1.6 x 0.4 mm	Quick connect, (solderable) 2.0 x 0.5 mm	Screw terminals, 0.250" Q.C.	Solder terminals, 0.110" Q.C. (solderable)	Screw terminals, 0.110" Q.C., and universal plug-in (solderable)
Operating Temperature	No lamp: -13 to 149°F (-25 to 65°C) Lamp: -13 to 113°F (-25 to 45°C)	No lamp: -13 to 149°F (-25 to 65°C) Lamp: -13 to 113°F (-25 to 45°C)	No lamp: -13 to 140°F (-25 to 60°C) Lamp: -13 to 104°F (-25 to 40°C)	-13 to 149°F (-25 to 65°C)	No lamp or LED: -13 to 149 °F (-25 to 65°) Lamp: -13 to 113°F (-25 to 45°C)	-13 to 185°F (-25 to 85°C)	-13 to 131°F (-25 to 55°C)	-13 to 131°F (-25 to 55°C)
Storage Temperature	-40 to 185°F (-40 to 85°C)	-22 to 185°F (-30 to 85°C)	-22 to 185°F (-30 to 85°C)	-40 to 185°F (-40 to 85°C)	-40 to 185°F (-40 to 85°C)	-40 to 203°F (-40 to 95°C)	-40 to 185°F (-40 to 85°C)	-40 to 185°F (-40 to 85°C)
Vibration	10G @ 10-2000 Hz amplitude 1.5 mm	10G @ 10-2000 Hz amplitude 1.0 mm	10G @ 10-2000 Hz amplitude 1.0 mm	10 G @ 10 - 2000 Hz amplitude .75 mm	10G @ 10-2000 Hz amplitude 1.0 mm	10 G @ 10 - 2000 Hz amplitude .75 mm	10 G @ 10 - 2000 to 10 Hz amplitude 0.75 mm	10 G @ 10 - 2000 to 10 Hz amplitude 0.75 m
Shock	>15 G @ 11 msec	>15 G @ 11 msec	>10 G @ 11 msec	50 G @ 11 msec	>20 G @ 11 msec	50 G @ 11 msec	50 G @ 11 msec	50 G @ 11 msec

Technical Information

Low Level				
01/11/14/15/19/21 30/31/41/51/52/99	70	84/92	96	97
Max. 2PST N.O. or N.C. 4 bifurcated contacts	1 N.O.	1 N.O.	1PDT Form C	Max. 2PST N.O. or N.C. bifurcated cont.
Momentary or maintained	Momentary	Momentary	Momentary or maintained	Momentary or maintained 1 or 2 poles
Gold over nickel	Gold	Gold	Gold plated on nickel	Gold plated on nickel
≤50 mΩ in new state	≤100 mΩ in new state	≤100 mΩ in new state	≤100 mΩ in new state	≤50 mΩ in new state
≤100 μsec	≤1 msec	≤1 msec	≤2.5 msec	≤200 μsec
0.118" (3 mm)	0.016" (0.4 mm)	See Note ④	0.067" (1.7 mm)	0.102" (2.6 mm)
300-350 grams (3-3.5 N) Series 99: 130 grams (1.3 N)	210 grams (2.1 N)	See Note ⑤	140 grams (1.4 N)	220 grams (2.2 N)
100 μV/10 μA to 42 V/100 mA	42 V/50 mA maximum 50 mV/10 μA minimum	42 V/50 mA maximum 50 mV/10 μA minimum	42 V/100 mA maximum 100 μV/50 μA minimum	42 V/100 mA maximum 100 μV/10 μA minimum
100 μV/10 μA to 42 V/100 mA	42 V/50 mA maximum 50 mV/10 μA minimum	42 V/50 mA maximum 50 mV/10 μA minimum	42 V/100 mA maximum 100 μV/50 μA minimum	42 V/100 mA maximum 100 μV/10 μA minimum
100 mA	50 mA	50 mA	100 mA 3 VA max.	100 mA 5 VA max.
5-million operations	≥5-million operations	≥1-million operations	≥5-million operations	≥5-million operations
2500 VAC 50 Hz, 1 min	500 VAC 50 Hz, 1 min	500 VAC 50 Hz, 1 min	500 VAC 50 Hz, 1 min	500 VAC 50 Hz, 1 min
Universal (PCB, solder, or quick connect)	Printed circuit board	Printed circuit board	Printed circuit board	Printed circuit board
No lamp: -13 to 149°F (-25 to 65°C) Lamp: -13 to 113°F (-25 to 45°C)	-13 to 185°F (-25 to 85°C)	-13 to 158°F (-25 to 70°C)	-13 to 185°F (-25 to 85°C)	-13 to 149°F (-25 to 65°C)
-40 to 185°F (-40 to 85°C)	-40 to 185°F (-40 to 85°C)	-40 to 176°F (-40 to 80°C)	-40 to 185°F (-40 to 85°C)	-40 to 185°F (-40 to 85°C)
50 Hz @ 1.5 mm	10 g @ 10 - 2000 Hz amplitude 0.75 mm	10 g @ 10 - 2000 Hz amplitude 0.75 mm	10 g @ 10 - 2000 Hz amplitude 0.75 mm	10 g @ 10 - 2000 Hz amplitude 0.75 mm
15 G @ 11 msec	≥50 G, 11 msec	≥50 G, 11 msec	30 G, 11 msec	50 G, 11 msec

Notes

- ① **Mechanical life**
 Pushbutton: $\geq 3 \times 10^6$
 Lever: $\geq 2.5 \times 10^6$
 Emergency stop: $\geq 5 \times 10^4$
 Keylock: $\geq 5 \times 10^4$
- ② **Gold over silver contacts**
 minimum: 5 VAC/10 mA
 maximum: 250 VAC/6 A
Silver contacts
 minimum: 20 VAC/500 mA
 maximum: 250 VAC/6 A
- ③ **Gold contacts**
 minimum: 100 μV/10 μA
 maximum: 42 V/100 mA
Silver contacts
 minimum: 20 VAC/10 mA
 maximum: 250 VAC/5 A
Silver contacts (screw terminals)
 minimum: 20 VAC/10 mA
 maximum: 250 VAC/6 A
- ④ **Lens travel**
 switch element: 0.020" (0.5 mm)
 with actuator: 0.032" (0.8 mm)
- ⑤ **Operating force**
 switch element: 200 grams (2 N)
 with actuator: 350 grams (3.5 N)

Technical Information

Switch Elements

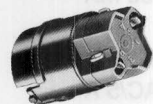
EAO offers a number of switch elements that can be used with various types of actuators. Whether your application requires high current ratings, logic level circuitry, or dry circuit considerations, EAO has a switch element and actuator designed to meet your needs.

Snap Action

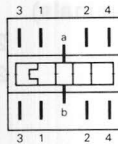
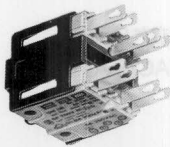
**Series 01, 11,
14, 15, 21, 30,
31, 32, 41, 51, 52**



Snap-action switching element with axial plug-in terminals, 2.8 x 0.5 mm (0.110 x 0.020). These elements cannot be stacked hence only one element per pushbutton.

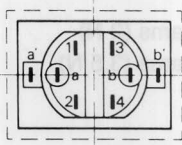


Snap-action switching element with solder terminals at the sides. These elements can be stacked up to 4 elements per pushbutton.

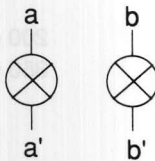


Switch contact blocks available with 1 or 2 poles with or without lamp terminals. Terminations are solder or 2.8 x 0.5 mm (0.110 x 0.020) Q.C.

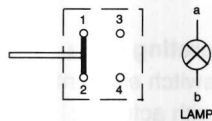
Series 41 split lens



Low level



Lamp connections

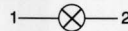
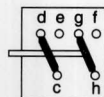


Form Z double air break configuration, self-cleaning contacts

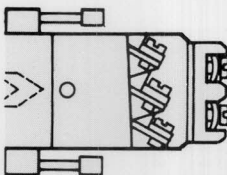
Series 02,03



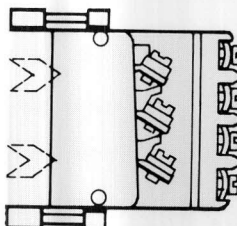
Lamp



Lamp



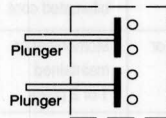
02 Typical



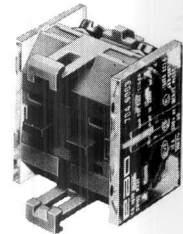
03 Typical

Series 04

Series 04 contact blocks are also available in slow-make, slow-break contacts, screw terminals, or 6.3 x 0.8 mm (0.250 x 0.030) Q.C. with several contact materials to match applications.



LAMP



Switch Block

1PST or 2PST, N.O. or N.C., up to four blocks per actuator

Series 18



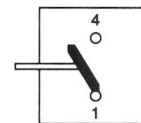
Indicator
-- = cathode, + = anode



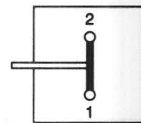
Normally open pushbutton



Normally closed pushbutton



Normally open

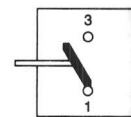


Normally closed

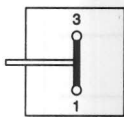


1PST contact, silver or gold over silver with 2 x 0.5 mm (0.079 x 0.020) Q.C. tabs

Series 19



Normally open

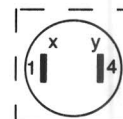


Normally closed

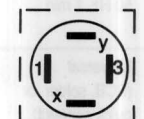


Lamp

1PST contact, silver or gold over silver with 2.0 x 0.5 mm (0.079 x 0.020) Q.C. tabs



Indicator

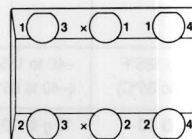


Pushbutton

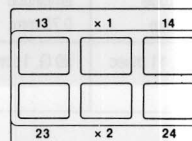
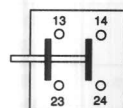
Universal terminals permit use as:
PCB connector
Solder
Quick connect 2.0 x 0.5 mm (0.079" x 0.020")

Series 22

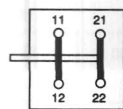
1PST or 2PST, double air break (3 mm), N.O. or N.C. or one of each



Screw Terminal



Q.C. Terminal
6.3 x 0.8 mm (0.250 x 0.030) Q.C. terminals



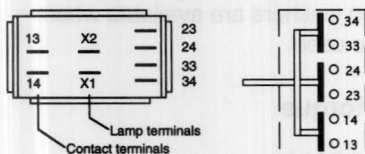
Lamp

Technical Information

Snap-action (cont.)

Series 61

Snap-action contact block



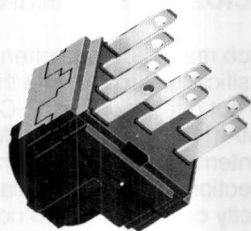
Example: 3PST, N.O.

Snap-action elements with double break 1P, 2P, or 3PST, N.O. or N.C., silver or gold over silver contacts.

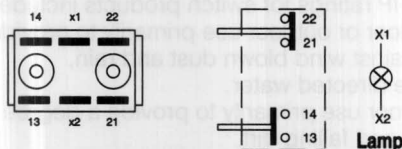
Types of Terminations:

1. Solder with terminal guard.
2. 2.8 x 0.5 mm (0.110 x 0.020) Q.C. terminations or PCB connector.
3. 2.8 x 0.5 mm (0.110 x 0.020) Q.C. terminations or solder.
4. Screw

Lamp



Slow-make contact block



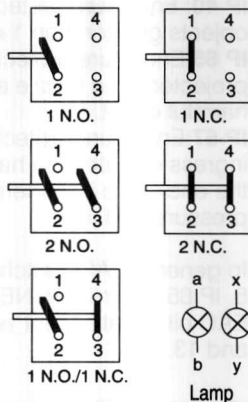
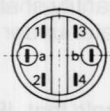
Example: 1 N.O./1 N.C.

Low Level

Series 01, 11, 14, 15, 19, 21, 30, 31, 41, 51, 52, 99

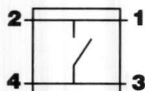
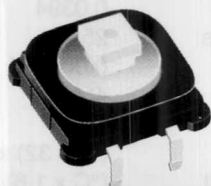


Low level switch element with universal terminals (solder, 2.0 x 0.5 mm 0.079 x 0.020 Q.C., PCB, connector). Bifurcated contacts.

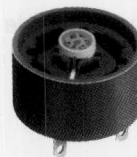


Series 70

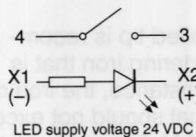
Printed circuit board switch with two independent gold contacts with tactile feel. Reliable switching even at 50 mV/10 μ A AC or DC.



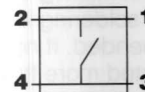
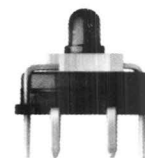
Series 84/92



Series 84 and 92 switches have two independent gold contacts with tactile feel. They offer reliable low level switching even at 50 mV/10 μ A AC or DC.

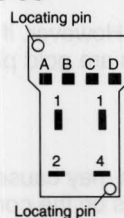


Series 84



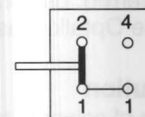
Series 92

Series 96



LED Location & Polarity Definition

Single LED and polarity location: B (-), C (+) or A (-), D (+)
Dual LED and polarity location: B & C (-), A & D (+)

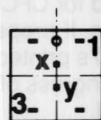


1PDT Gold contacts

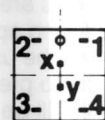
PCB Switch, indicator, and panel plug

Pin layout to fit in-line connector

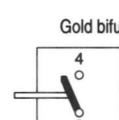
Series 97



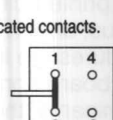
Indicator



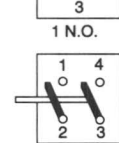
Illuminated pushbutton



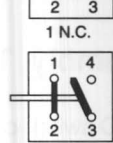
1 N.O.



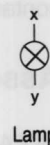
1 N.C.



2 N.O.

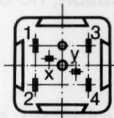


1 N.C./1 N.O.

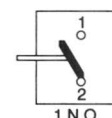


Lamp

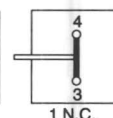
Series 99



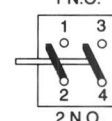
Single-illuminated pushbutton



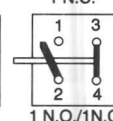
1 N.O.



1 N.C.



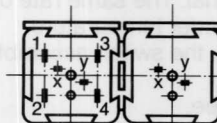
2 N.O.



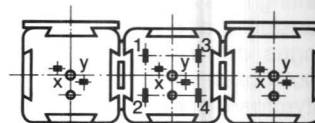
1 N.O./1 N.C.



Lamp



Double-illuminated pushbutton



Triple-illuminated pushbutton

Technical Information

Soldering Instructions

Correct soldering techniques are important to the reliable operation of EAO switches.

Hand Soldering

Soldering temperature

A soldering iron with a temperature controlled tip is recommended. If not available, do not use a soldering iron that is rated more than 15-20 watts. In any circumstance, the iron must never exceed 500°F. Soldering of a terminal should not exceed 5 seconds (IEC 68-2-20, test 2b, method 1A). Excess heat or time will damage switch contacts or draw flux into contact area.

Use of flux

EAO recommends elimination of flux entirely. However, if flux is preferred, use only a small amount. Terminals are gold plated or have Optalloy, assuring easy soldering.

Caution

Use of solvents to clean flux from solder joints may cause contact contamination by leaving flux residues on the contact. The switch element plastic material will not be affected by leaving residues of flux. If a solvent must be used, isopropyl alcohol is recommended.

Machine Soldering

EAO's printed circuit board components are designed for CFC, aqueous, or non-wash machine soldering applications. If proper procedures are implemented, such as the use of EAO's printed circuit board connectors or vinyl caps to prevent the ingress of contaminants, then reliable soldering will be achieved.

Assembly, Testing, & Mounting

All EAO switch contact blocks are assembled by automated equipment. Contacts and terminals are automatically positioned in the molded base and held in place by a small amount of epoxy resin adhesive. The epoxy not only serves to prevent internal parts from shifting, but also helps to prevent solder flux from entering the switching mechanism. After assembly of the switch is completed, the epoxy is cured in an oven to assure that it is 100% solid. The contact blocks are then checked for contact resistance, operated 100 times, and re-checked. When two or more contact blocks are to be assembled on one actuator, only those switches with the same operate position are selected. This assures that in a multipole application, no one pole will operate before any of the others.

Materials

All switch contact blocks are molded from diallyphtalate, a stable material at high temperature with a low rate of moisture absorption. This provides excellent dimensional stability under all applications and environments. Switch housings and mounting nuts are made of the same material. The same rate of expansion of all components means that under temperature changes, due to lamp heating for example, the switch assembly will not loosen in its mounting.

All styrofoam packaging material is CFC-free.

Mounting switch components

EAO strongly recommends the use of special tools designed to help mount and unmount switch components. These tools are listed in the "Accessories" section of this catalog and will prevent damage to lenses, lamps, contact blocks, and other components when used correctly. There is a correct size and shape of mounting hole shown for each switch. The holes often have flats or tabs to prevent rotation, particularly for keylocks and lever switches. Anti-rotation washers are available when round mounting holes must be used.

Recommended mounting torque

4.50 inch-pounds, nominal

8.75 inch-pounds, maximum

Enclosure Protection Classifications

Switch manufacturers often use standard enclosure protection classifications to indicate the ability of switch components to seal out dust and liquids. Commonly used ratings include NEMA (National Electrical Manufacturers Association) and IEC-IP (International Electrotechnical Commission — Ingress Protection). Although similar, these classifications are not directly comparable and converting from one to the other requires caution.

Common NEMA and IEC-IP ratings for switch products include:

NEMA 4: Intended for indoor or outdoor use primarily to provide a degree of protection against wind blown dust and rain, splashing water, and hose directed water.

NEMA 5: Intended for indoor use primarily to provide a degree of protection against dust and falling dirt.

NEMA 6: Intended for indoor or outdoor use primarily to provide a degree of protection against the entry of water during occasional temporary submersion at a limited depth.

NEMA 13: Intended for indoor use primarily to provide a degree of protection against dust, spraying of water, oil, and non-corrosive coolant.

IP 40: Enclosure protected against dust contamination of solid objects greater than 1 mm.

IP 65: Enclosure protected against all dust contamination; water projected by a nozzle against the enclosure shall have no harmful effect.

IP 67: Enclosure protected against all dust contamination; ingress of water in a harmful quantity shall not be possible when the enclosure is immersed in water under defined conditions of pressure and time.

In general, EAO Switch Corp. feels that IP 40 is similar to NEMA 5. IP 65 is similar to NEMA 4 and 13. IP 67 is similar to NEMA 6. EAO oil & waterproof switches meet both IP 65 and NEMA 4 and 13.

Some Useful Conversion Factors

To convert from	To	Multiply by
millimeters	inches	0.0394
inches	millimeters	25.4
grams	pounds	0.002205
pounds	grams	453.6
grams	newtons	0.01
Fahrenheit	Celsius	(°F - 32) x 5/9
Celsius	Fahrenheit	(°C x 1.8) + 32